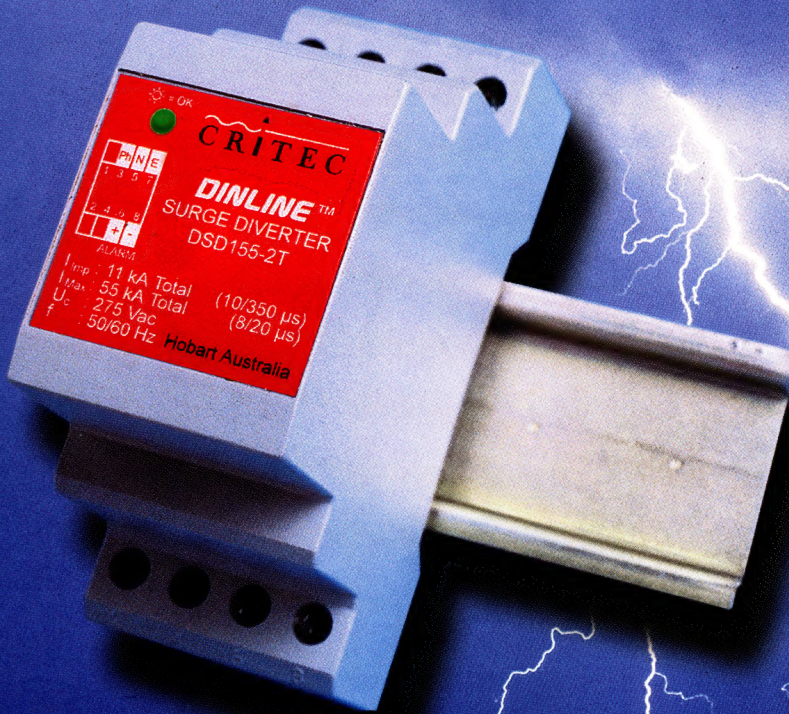


# AUSTRALIAN Electronics ENGINEERING

Vol.29 N°10

OCTOBER 1996



## Product Survey

EMI/RFI, static control, lightning and protection equipment

**Page 29**

## Protection

Silicon avalanche diodes

**Page 40**

Transient voltage suppression

**Page 45**

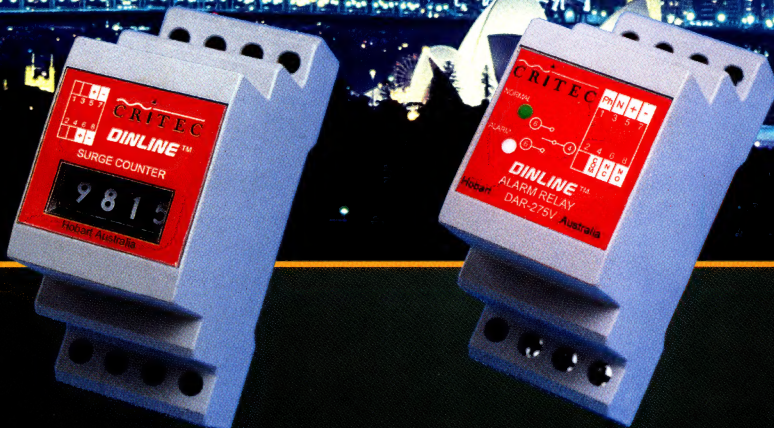
## T&M

Low-frequency data collection

**Page 49**

EMC precompliance testing

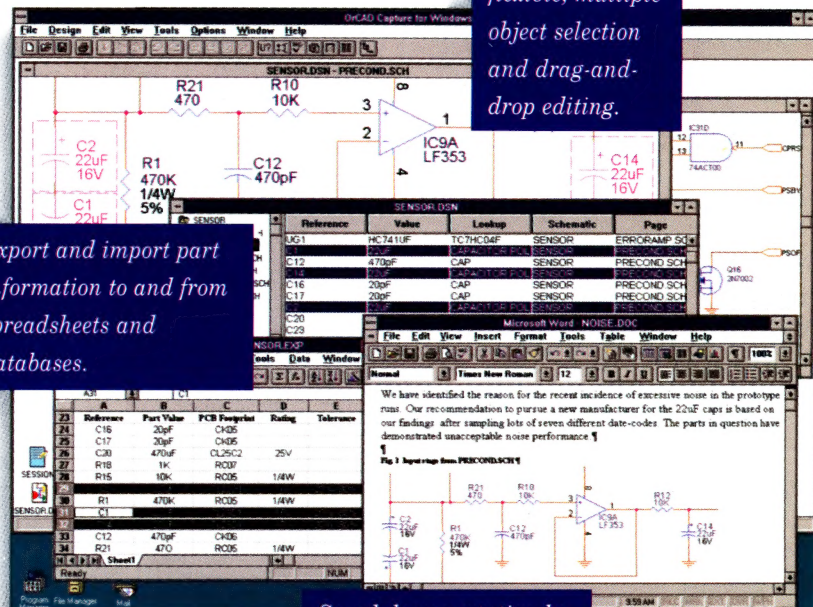
**Page 54**



**Critec DINLINE — economical and reliable protection from Global Lightning Technologies. Page 10**



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# Contents

## NEWS

- 12** Industry bearing brunt of budget cuts — The Australian Electrical and Electronic Manufacturers' Association (AEEMA) has commented on the recent federal budget, stating that industry has borne a disproportionate share of the cuts in the budget expenditure.

## QUALITY

- 22** Quality workmanship: going beyond ISO 9000 — The ISO 9000 series of quality standards can help companies maintain quality levels. But companies need to go beyond the letter of the standard to really reap the benefits.

## PRODUCT SURVEY

- 29** EMI/RFI, static control, lightning and protection equipment — The latest products for protection of equipment and people.

## PROTECTION

- 40** Overvoltage protection using silicon avalanche diodes — A look at protection systems based around avalanche diode technology.
- 45** Transient voltage suppression — A roundup of the most common transient protection devices and their properties.

## TEST & MEASUREMENT

- 50** Low-frequency data collection: Pushing the acquisition envelope — Collecting data in low-frequency, long duration testing may seem like a simple exercise, but needs careful thought and system design to be accomplished reliably and economically.
- 54** EMC precompliance testing — With the January 1, 1997 deadline for EMC compliance looming, we look at things you can do to smooth your product's way through the testing process.
- 58** Vertical sampling: A new look at counting waveforms — This article discusses a new sampling technique which has allowed instrument companies to incorporate a waveform viewing capability directly on the counter.

## DESIGN TIP #38

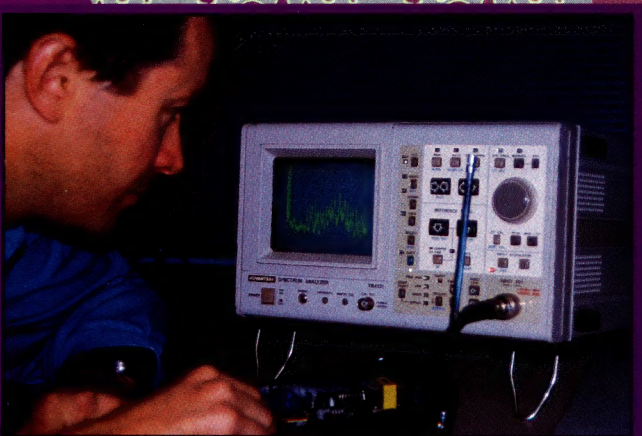
- 80** Recovering from multiple power fluctuations — Power supply fluctuations can cause microprocessor systems to behave erratically. In this design tip we look at how to make your design cope gracefully with multiple power dips.

## LAST WORD

- 84** Ian Neville — Right side of the tracks.

## DEPARTMENTS

|                        |    |
|------------------------|----|
| From the Editor's Desk | 5  |
| Latelines              | 7  |
| On The Move            | 20 |
| Distributor News       | 14 |
| For Your Diary         | 10 |
| New Products           | 62 |
| Index to Advertisers   | 70 |

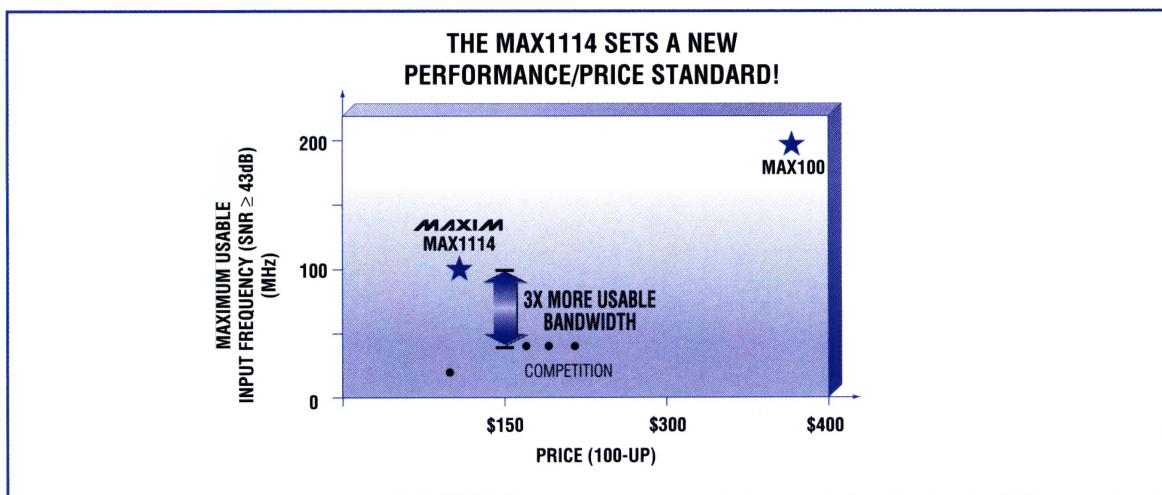


**This month:**  
EMC compliance becomes mandatory for new products on January 1, 1997. Companies can save time and money in product development by knowing what the standard requires and performing precompliance testing throughout the development cycle.  
See page 54.

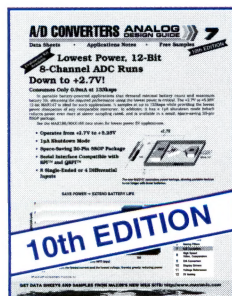
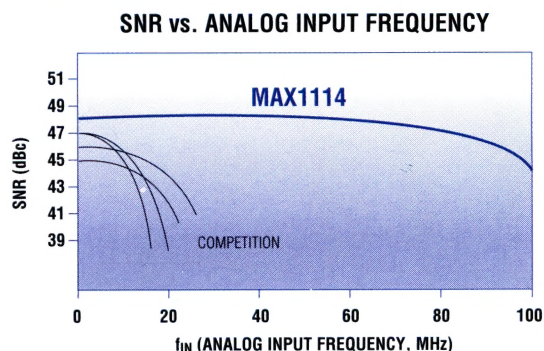


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## FROM THE EDITOR'S DESK

# Dining with the enemy.



Recently I attended the Australian Electrical and Electronics Manufacturers' Association (AEEMA) annual dinner at which the winners of AEEMA's Exporter of the Year awards were announced. *AEE* will be covering the event in full in the November issue, but congratulations now to Alcatel Australia and Radio Frequency Systems, who took out the major prizes in the Telecommunications category (for exports over and under \$25 million respectively), and to Olex Cables' Power & Industrial Division and the TechComm Group, winners of the two major awards in the Energy category.

Guest speaker at the dinner was the Deputy Prime Minister and Minister for Trade Tim Fischer. Given some of the Coalition's recent budget measures, Mr Fischer was a sure bet to draw a bit of flack from other speakers on the night — and he did.

John Almgren, the president of AEEMA, in his speech introducing Mr Fischer, was quick to point out to the Deputy Prime Minister the unhappiness in the industry about the disproportionate share of expenditure cuts borne by electronics and electrical manufacturers.

Almgren spoke specifically about the significant reduction in support for R&D and export promotion, and changes to areas like the computer bounty, the Tariff Concession Scheme and DIFF. He commented that he was concerned that decisions were being made without any serious consideration of a long-term strategy for the industry.

I share his concerns. One of the industries hardest hit by these expenditure cuts is telecommunications, an industry which has burgeoned in Australia in recent years, but one which must work in a global market. Australian companies just don't have the population base to support a high-tech and development-intensive industry like telecommunications purely on local sales. Unfortunately, many of the overseas companies we compete against for international contracts do. This gives them the luxury of ploughing profits made domestically into developing export markets.

The government needs to recognise this and be very mindful of the fact that in order to establish themselves on an internationally competitive footing, Australian high-tech companies need government support. This is not charity, though. It's an investment in the future, because once Australian companies establish a beach-head on foreign shores and start winning major contracts in the face of international competition, the money flow reverses itself.

If the government wants a long-term solution to the budget deficit problem, then it must look past immediate expenditure cuts and concentrate on schemes that will ultimately bring wealth into this country from outside. Cutting funding for industry export initiatives now, when Australian companies are just starting to gain recognition, is a little premature and a bit like taking stitches from a recent hernia operation to stitch a button back on your shirt. Sure you'll look a bit better from the outside for a while, but pretty soon your guts are going to fall out.

Another speaker at the dinner, John Wood of Keycorp, who received the Individual Telecommunications Exporter of the Year award, subtly reminded Mr Fischer of the imbalance in import duties on plastic cards between ourselves and some of our trading partners. He pointed out that while his company must pay up to 14% duty to get cards into some countries, overseas companies pay nothing to get cards into Australia. This is just another reminder that the 'level playing field' can look a little tilted from some perspectives.

For his part, Tim Fischer gave a solid performance as a champion of industry and vowed to take up the cause, even though a bit of the old 'times are tough and we all have to tighten our belts, pull together and pedal harder' routine did creep in from time to time. Whether he will take the industry's thoughts back to Canberra with him and, more importantly, take them into consideration when looking at further expenditure cuts is anyone's guess. We can only hope he does.

Incidentally, the dinner was delicious!





# Ferroelectrics set to sweep industry

The Dean of Science at the University of NSW, Professor Jim Scott, has become a celebrity in Japan and the US as a member of the team that developed ferroelectric thin film, a new material set to revolutionise the micro-electronics industry, according to a recent article in *Ascent Technology Magazine*. When added as an extra layer to the top of silicon chips, the new film dramatically increases their memory capacity. Since the patent was granted in mid-1995, fifteen international companies have used the technology in prototypes. Panasonic is already manufacturing five million chips a month using the new technology, for use in mobile telephones and televisions. Siemens, Motorola and Hyundai have also obtained licences to manufacture chips using the new technology.

Professor Scott explained in the ATM article that the new material is a crystalline structure composed of strontium, bismuth, tantalum, niobium and oxygen, and has cells that "flip" when voltage is passed through them. This makes the material ideal for the storage of binary data. The new technology will enable 100 times more capacitors to be mounted onto a chip.

Professor Scott said that there is a lot of excitement about the new material in the industry, "but there's also an element of abject fear: they recognise that if they don't get into this game, they'll be out of the game." He continued that "while wrist-watch-size mobile phones may not be marketed because of the difficulty of getting a keyboard small enough, there are dozens of other gadgets like car faxes and compact, lightweight, fast virtual reality devices just waiting for a development like ferroelectrics."

Professor Scott indicated to *AEE* that interest from Japan is still crackling. He will be visiting Sony there in late September regarding a cooperative research program, under which Sony is expected to provide funds, engineers and PhD students in Australia, in what Professor



*Inspiring "abject fear" - Professor Jim Scott with a liquid-helium low-temperature cryostat which utilises the new ferroelectric thin film.*

Scott said could become a ferroelectrics research centre.

The original idea came from US company Symetrix where Professor Scott was part of the research team, and the company still holds the original patents which Panasonic is utilising. On migrating to Australia Professor Scott continued work on the technology at RMIT and then the University of NSW, and he and his team are now taking the technology in different directions with applications in air-

craft radar and medical fields. Patents he and his team have lodged recently are expected to be released in the name of the University of NSW. A patent application is currently under consideration for using the technology to replace every X-ray film stored in hospitals with computer chip storage using the new technology, a development which Professor Scott says would save enormous amounts in archival storage and retrieval costs □

## Cards Australia - mixed reception

The crowd at the recent Cards Australia '96 exhibition and conference at Sydney's Darling Harbour has been described as "small but quality". A total of 38 exhibitors plied their wares to 2000 visitors over the three days of the exhibition and conference.

John Atkinson, general manager of Gemplus Australia, the sales and mar-

keting arm of Gemplus Cards International which manufactures smart cards, found the show definitely worth their while. He said that though the crowd wasn't large at the exhibition, the quality of contacts made was high and that he expects that these will generate significant business over the next six months. Gemplus is already booked in to next

year's show.

Siemens saw their stand as certainly being profitable, though they also commented on the poorer attendance than they'd expected. Martin Spiteri, sales engineer with Siemens, said "the contacts we did make were high quality, but part of the value of it for us was increasing awareness of where Siemens fits in



to the industry, amongst not so much direct customers as indirect customers."

Spiteri was disappointed with the topics in the concurrent conference, however, saying they were too project-oriented. "I was hoping for information on where the industry is heading, who's spending money on R&D in Australia." He felt three days was too much for the exhibition - two would have sufficed, and that running the conference concurrently with the exhibition meant the stands were all inundated during conference breaks with very few visitors in between.

One industry source AEE spoke to was not impressed, however, summing up the exhibition as "a total waste of time", seeing it as "preaching to the converted." He said there was not enough international representation in either stands or visitors to make it worth his while.

Philips Components, whose main contribution to the smart card industry is supply of ICs, took a different approach, setting up a showcase of their latest capabilities and inviting all their large potential customers to view their potential in action. Nicholas Badger, product manager, smart cards with the company, said that largely due to this approach, the exhibition was very successful for them. He said that being the only company there demonstrating a working contactless card also netted them a lot of attention. Badger noted that the well-known local companies seemed to do well at the show, as opposed to some European standholders who had noticeably unpatronised stands.

Badger also commented on the networking role the show played for the industry. "As the industry is small and everyone knows everyone else, companies put each other onto suitable contacts or business partners for the development of the product they were interested in." Ian Neville from Cardcorp, acknowledging this phenomenon, however found it disappointing. "We were hoping to see some new blood."

He said he had recently been to a similar type of show in Singapore which had generated many more leads and actual business. He said the reasons for this are attributable in part to the distance to Australia and the visas etc necessary to enter here. Several large Asian companies he spoke to said they didn't think it worth the trouble to bring their equipment etc to the Australian show. Singapore has much easier entrance requirements and, as a consequence, there was a much greater international presence there, with Asian, Arab, European, and American exhibitors and attendees who did not come to the Australian show.

Cards Australia '97 is to be held in Melbourne next year. □

**The IEAust publication Engineering Times reported recently that 40% of the top 1000 NSW HSC students in 1995 applied for medicine and combined law.** IEAust president Tom Connor commented that no country could survive when its best students chose the service professions over the wealth-generating professions such as engineering. He said Australians must realise they "cannot sustain their present lifestyles by selling services to each other. Someone has to create new wealth through primary and secondary production and infrastructure development." He felt Australia was relying too heavily on immigration to overcome the shortage of local engineering students. □

**A Californian company has developed a design methodology that enables new 200mm wafer manufacturing facilities to accommodate future generations of 300mm tools by means of an adaptation algorithm, obviating the need to build a separate 300mm fab.** B&W Projects, which offers engineering and project management services to the semiconductor industry, says it is possible to design in the changes required for the transition to 300mm at very minimal initial cost. □

**The Australian Financial Review reported on September 16 that the Datacraft Group had reported a loss for the last financial year of \$8.885 million on revenue of \$193.1 million.** These results were from abnormals of \$6.49 million, comprising restructuring costs of \$1.6 million, a \$1.9 million write-off of goodwill and capitalised R&D, and a \$3 million provision for inventory. The company said the trading loss had been partially offset by further growth in the group's Asian business, and record revenue and profit from its New Zealand operations. □

**Banksia Technology scooped the product awards at Melbourne's PC 96 recently, winning the Best Networking Product award with their ISDNexpress, a terminal adaptor providing ultra-fast communications over ISDN.** The product was also a finalist in four other categories. Products were evaluated with criteria such as innovation, reliability, manageability and value for money. The company said the success of the product reflected the growing demand for greater bandwidth at an affordable price, for the SOHO (small office, home office) market and corporate users alike. The company's MacVoiceModem 336, a data/fax/voice modem for Macs, was also a finalist, in the Best New Macintosh Product category. □

**NetComm has announced a \$1.75 million profit for the last financial year, a result of a 41% revenue jump to over \$48 million.** A spokesman for the company said the core modem business enjoyed improved profitability, though current trading is slower than expected. It anticipated that revenues and profits would continue to grow, however. □

**A network of three Brisbane companies united as Oz Electronics Manufacturing (OEM) under AusIndustry's Business Networks program has imported state-of-the-art PCB assembly equipment, putting the network at the forefront of that technology.** Touch-screen driven and capable of placing up to 8000 components an hour, the Contact Systems 3AV has the capacity to handle high-volume manufacturing for consumer goods. The network aims to become the market leader in contract electronics in southern Queensland. □

**Siemens took to the road recently with a travelling product show called "Defining Automation Technology" to launch their new range of industrial automation products.** Featuring the Siemens Simatic S7 PLCs, the show started in Auckland and went to Melbourne, Sydney, Brisbane, Adelaide and Perth. The company thought coming to the customer was the best approach to spread the word about their new range, with expert-guided working displays which allowed customers to experience the equipment first hand. □

**NetComm's Memorandum of Understanding with Boca Research has been finalised into contractual agreements.** The first part of the alliance will allow NetComm to re-enter export markets as an OEM supplier to Boca, providing the company with a lower risk international distribution strategy. The second part of the alliance will soon provide NetComm with local distribution access to some of Boca's non-modem products. □



# PCB facility opens in Victoria

**P**recision Circuits' new high-tech PCB manufacturing facility was opened in Victoria recently by the Victorian treasurer and minister for multimedia, Alan Stockdale. The facility is next to the company's existing premises and incorporates the latest PCB manufacturing equipment available in Australia, including automatic optical inspection, NC scoring, flying probe bare board testing and vacuum-assisted hydraulic presses.

Marketing director Frank Copping said "Our commitment to the future of the electronics industry has been backed up with an investment of over \$2 million in the last 18 months on state-of-the-art manufacturing facilities and equipment. The upgrade of the company has covered the whole PCB manufacturing cycle from the very beginning of the cycle, where we have installed the latest computer-aided design manufacturing system to verify the design and remove possible manufacturing glitches or violations, combined it with the latest technology laser photoplotter to ensure the images are perfect for production, to the end of the process where the flying probe tester verifies that the PCB is supplied exactly to the cus-

tomers' requirements in the shortest possible time and at the lowest cost."

Copping said the new facility increas-

es the efficiency and speed with which the company can turn out high-tech prototype PCBs. □



*Opening act — Frank Copping, Robin Pleydell (Precision Circuits' chairman) and Victorian treasurer Alan Stockdale, MP.*

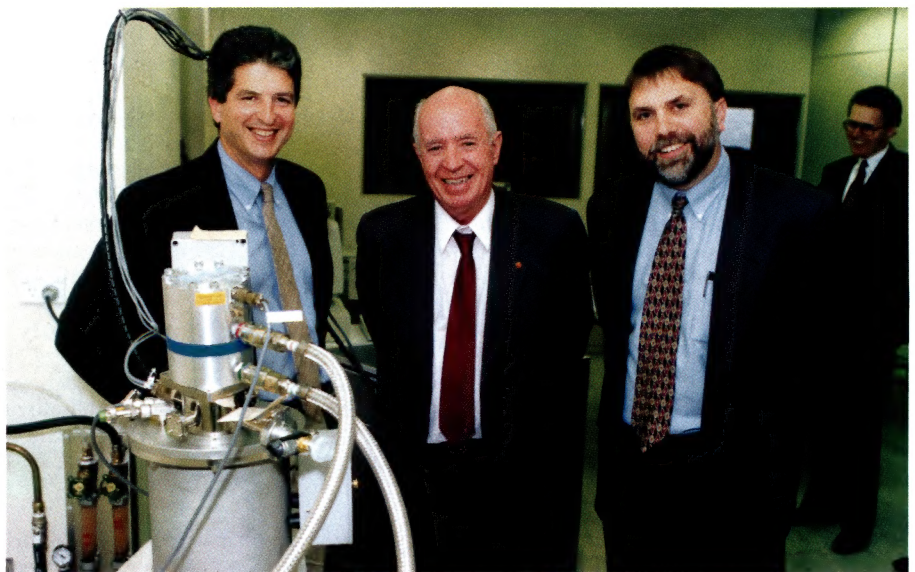
## "Across the rooftops of the world..."

**S**ydney company Pacific Solar received international attention recently when representatives from 16 APEC group countries met in Sydney at the end of August for the inaugural Energy Summit meeting.

Site tours of relevant bodies, conducted as part of the summit, included a visit to Pacific Solar's Sydney laboratories. Federal Minister for Resources and Energy Senator Warwick Parer said during the summit that he believed Australia can play a leading role in the Asian region in developing solar power as a major adjunct to traditional sources of energy. Energy ministers or official government parties from Papua New Guinea, Indonesia, Hong Kong and Singapore were among those visiting the company's R&D centre.

David Hogg, the company's managing director told Senator Parer that "we are confident that in four years Pacific Solar will be the first in the world to be producing solar cells that will generate electricity at a similar price to the existing electricity supply."

At present solar cell demand is high-

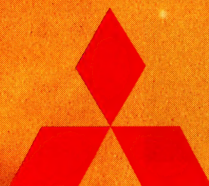


*Ministering to the solar masses - Prof. Martin Green of Pacific Solar with the Minister for Resources and Energy Warwick Parer, and David Hogg.*

est in Europe, North America, Asia and west Asia, where mainstream electricity costs in some cities are twice those of

Australia. Hogg said the company's vision was to have their solar cells seen "across the rooftops of the world." □



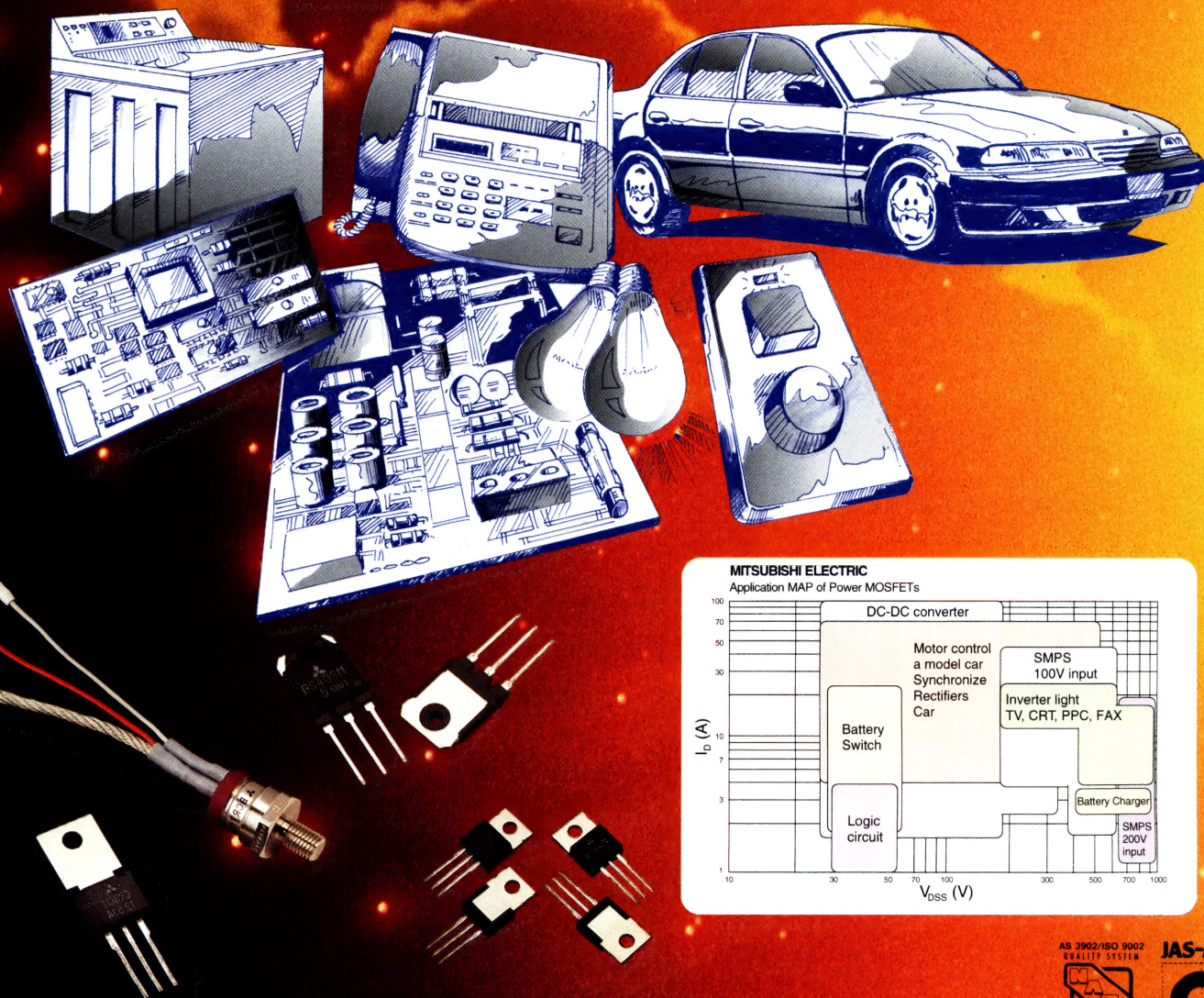


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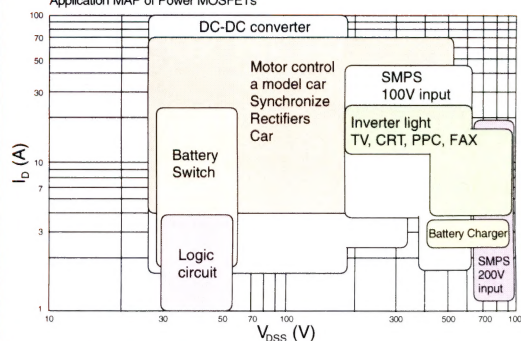
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**Growing the high-tech enterprise — Encouraging entrepreneurs: how to build on their ability, October 16,** Australian Technology Park, Redfern, Sydney. Contact: The Warren Centre for Advanced Engineering, Rm 203, Level 2, Engineering Faculty building J13, University of Sydney NSW 2006, tel (02) 351 3752. □

**Optical Fibre 17 October** Sydney Boulevard Hotel, **21 October** Old Melbourne Hotel. Contact IIR Conferences, (02) 9954 5844, fax (02) 9959 4684. □

**Advanced Design for Surface Mount Technology October 17 & 18** Australian Electronics Development Centre, Broadmeadows, VIC. Contact AEDC, tel (03) 9302 1422, fax (03) 9302 1201. □

**The R&D Tax Concession October**

**24 & 25** Menzies Hotel Sydney. Contact: AIC Conferences tel (02) 9210 5777 fax (02) 9221 7773. □

**Wind River Systems' Tornado and V<sub>x</sub>Works RTOS & Development Environment Perth October 28, Adelaide October 29, Melbourne October 30, Canberra October 31, Sydney November 1.** Contact: Mayer Krieg tel (08) 8291 3222 fax (08) 8291 3200. □

**Electromagnetic Compatibility and Interference November 6 & 7** Carlton Crest Hotel, Melbourne. Contact: IBC Conferences tel (02) 9319 3755 fax (02) 9699 3901. □

**EMC Pre-Compliance Testing November 11 & 12** Lidcombe College of TAFE, Sydney. Contact AEDC, tel (03) 9302 1422, fax (03) 9302 1201. □

**Advanced Design for Surface Mount Technology November 14 & 15** Lidcombe College of TAFE, Sydney. Contact AEDC, tel (03) 9302 1422, fax (03) 9302 1201. □

**The Home Computer Show, November 15-18,** Melbourne. Contact: Australian Exhibition Services, tel (03) 9867 4500, fax (03) 9867 7981. □

**EMC Pre-Compliance Testing November 21 & 22** Australian Electronics Development Centre, Broadmeadows, VIC. Contact AEDC, tel (03) 9302 1422, fax (03) 9302 1201. □

**Networld+Interop 96, November 25-29,** Sydney. Contact: Synergy Conventions, tel (02) 369 1242, fax (02) 387 5482. □

**Electronic Manufacturing Process Control, November 27 — 28,** Broadmeadows, Victoria. Contact: Australian Electronics Development Centre, tel (03) 9302 1422, fax (03) 9302 1201. □

**Photonics Summer School November 27 - December 1** University of Queensland, St Lucia. Contact: Australian Photonics CRC tel (02) 9351 1930 fax (02) 9351 1910. □

**ACOFT '96, December 1-4,** Conrad Jupiters, Gold Coast, Queensland. Contact: Conference Secretary, ACOFT '96, IREE Society, P.O. Box 495, Milsons Point NSW 2061 tel (02) 9929 0099, fax (02) 9929 0587. □

**Advanced Design for Surface Mount Technology December 2 & 3** Adelaide Convention Centre. Contact AEDC, tel (03) 9302 1422, fax (03) 9302 1201. □

## Overseas

**Wescon '96 International Electronics Conference & Exhibition/ IC Expo '96 October 22-24,** Anaheim Convention Center, CA, USA. Contact: Wescon, 8110 Airport Blvd, Los Angeles CA 90045 tel +1 800 877 2668, fax +1 310 641 5117. □

**19th Convention of Electrical and Electronics Engineers in Israel November 5-6,** Jerusalem, Israel. Contact: ISAS International Seminars, P.O. Box 574, Jerusalem 91004 Israel, tel +972 2 652 0574, fax +972 2 652 0558. □

**Electronica 96, November 12-15,** Munich Trade Fair Centre, Germany. Contact: Margaret Lamy, German-Australian Chamber of Industry and Commerce, Level 2 St Andrew's House, 464 Kent St Sydney NSW 2000 tel (02) 261 4475. □

**Lithium-ion Battery Design '96: Performance, Safety, Cost December 9-11,** Hyatt Islandia Hotel, California USA. Contact: Melanie Briggs, Intertech Conferences, 411 US Route One, Portland, Maine 04105 USA, tel +1 207 781 9800, fax +1 207 781 2150. □

## BEHIND THE COVER

**Global Lightning Technologies (GLT)** has announced the release of its new **Critec DINLINE** family of surge diverters and filters. These products offer high reliability with high surge ratings, and convenience in installation on standard 35mm DIN rails. Critec DINLINE Surge Diverters (DSDs) include a range of Single and Three-Mode configured units. Both single and three-phase modules are available.

For superior protection of sensitive electronic equipment with load currents up to 20A, GLT has a range of Critec DINLINE Surge Filters (DSFs). DSFs filter the clamped waveform, following the shunt protection stage. Critec's Proline SRFs provide protection for applications with larger current loads.

Most DINLINE Surge Diverters and Filters feature built-in protection status indication. A retrofittable DINLINE Alarm Relay module can provide remote sensing and an electro-mechanical Surge Counter is available to record the number of impulses diverted by the DINLINE unit. All products have a 5-year warranty.

Contact your nearest Global Lightning Technologies office or phone 1800 808 948 for information. [2150](13132)

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# PHILIPS 80C51 8-BIT MICROCONTROLLERS

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- ◆ ROM?
- ◆ EPROM/OTP?
- ◆ FLASH EPROM?

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**ALSO**

**PHILIPS 8XC748/8XC749 MICROCONTROLLERS**  
2K x 8 (without I<sup>2</sup>C)

## DESCRIPTION

The **Philips 83C748/87C748** and **83C749/87C749** offers the advantages of the 80C51 architecture in a **small package** and at **low cost**.

The **8XC748** contains a 2k x 8 ROM (**83C748**) EPROM (**87C748**), a 64 x 8 RAM, 19 I/O lines, a 16-bit auto-reload counter/timer; a four-source fixed-priority level interrupt structure and on-chip oscillator;

The **8XC749** contains a 2k x 8 ROM (**83C749**) EPROM (**87C749**), a 64 x 8 RAM, 21 I/O lines, a 16-bit auto-reload counter/timer; a fixed-priority level interrupt structure, an on-chip

oscillator; a five channel multiplexed 8-bit A/D converter and an 8-bit PWM output.

Philips have an EPROM version of this device, the **87C749**, also available in both quartz-lid erasable and plastic one-time program-mable (OTP) packages. Once the array has been program-med, it is functionally equivalent to the masked ROM **83C749**. Therefore all references made to the **83C749** apply equally to the **87C749** unless explicitly stated otherwise.

The **83C749** supports two power reduction modes of operation, commonly referred to as the idle mode and the power-down mode.

## OTPs

There are no large minimum order quantity requirements as found with masked ROM devices, making **Philips OTP 80C51** microcontrollers ideal for prototyping and field testing, as well as production runs. They will eliminate waste in applications requiring repeated updates or software revisions as parts may be programmed to order, saving the need to scrap partial batches of mask devices.

## EPROMs

From the 1K EPROM **87C750** to the 32K EPROM **87C528**. Philips derivatives are available in a variety of packages and memory configurations. Feature sets are available to satisfy most requirements as a single chip solution, saving on cost and board area.

For more information on **Philips 80C51** Microcontrollers contact **Arlec**, the Australian distributor:

- Vic (03) 9727 8777
- NSW (02) 9793 8311
- Qld (07) 3865 5333
- SA (08) 297 0811
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# ARLEC

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# Industry bearing brunt of budget cuts

The Australian Electrical and Electronic Manufacturers' Association (AEEMA) has commented on the recent federal budget, stating that industry has borne a disproportionate share of the cuts in the budget expenditure, and that the additional imposts will lead to reductions in investment, production, R&D, employment and exports.

It has commented that for knowledge-based, global industries such as telecomms, the significant reduction in support in such areas as research and development, export promotion and the computer bounty will lead to a contraction in these activities. Taken with past decisions such as the changes to the tariff concession scheme and the abolition of DIFF, these decisions will impact adversely on industry competitiveness and the attractiveness of Australia as a source of business investment.

The Association also commented that the abolition of the international trade enhancement scheme which has supported many AEEMA members in penetrating difficult export markets is a blow to the export objectives of the industries.

The Association feels that the decisions were not taken with consideration of a long-term strategy, and the impact on the manufacturing industry. The programs which have been cut or abolished have assisted industry in making the transition from a domestically-focused, highly-protected industrial structure to one which is more competitive and export

oriented. The Association believes the government should adopt a broader and longer-term approach which raises national savings and strengthens the vitality

of manufacturing in Australia, an approach which must include a widening of the tax base. □



*Pictured at the opening on August 28 of Krone Australia's new \$5 million office and warehouse extensions at Berkeley Vale on the NSW Central Coast are, from bottom left, Bob Fitzgerald, director and joint general manager of Krone Australia; Klaus Krone, CEO of Krone AG in Germany; Paul Crittenden, state member for Wyong, and Bob Carr, Premier of NSW, who officially opened the facilities. Manufacturing manager with Krone Australia John Harris said the expansion has increased the size of the plant from 7000sq.m. to 10,500, and would help keep inventory down and improve stock-turn ratios. During the ceremony Mr Krone announced that Krone Australia would be the Asia Pacific headquarters for the Krone group. □*

# Spectrum licensing pitfalls

The Australian Electrical and Electronic Manufacturers' Association (AEEMA)'s Wireless Technology Forum has official-

ly responded to the Spectrum Management Agency's invitations to comment on the spectrum licensing of the 500MHz and 1.8GHz bands which is proposed to take place by auction.

Alex Gosman, executive director of AEEMA, commented "The proposed arrangements for auctioning the 1.8GHz bands do not appear to be above exploitation by those who may have no intention of developing infrastructure or establishing a service, but who can position themselves to benefit by extracting unearned profits from incumbents or those seeking to establish a national infrastructure.

"There is the need to develop options for remedial action to prevent speculation that will inhibit the development of new services and that will impact adversely on small companies. Because of the difference between the 500MHz and 1800MHz

allocations there will only be limited relevance from the lessons derived from the 500MHz auction. The stated aims of the auction process are to open up communications to new competitors rather than to generate revenue, and speculation must be discouraged."

Other major points made in the Forum's response to the SMA included concern over the lack of a provision for limiting uncoordinated devices outside allocated areas, support for upfront pricing and significant penalty provisions for payment defaulters, that the ACCC must issue as a priority a set of competition rules that will set the parameters for the 1800MHz auction and those to follow, and that the treatment of incumbents needs to be seriously reconsidered, particularly in respect of speculation and accommodation with new owners. □

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### — METHOD —

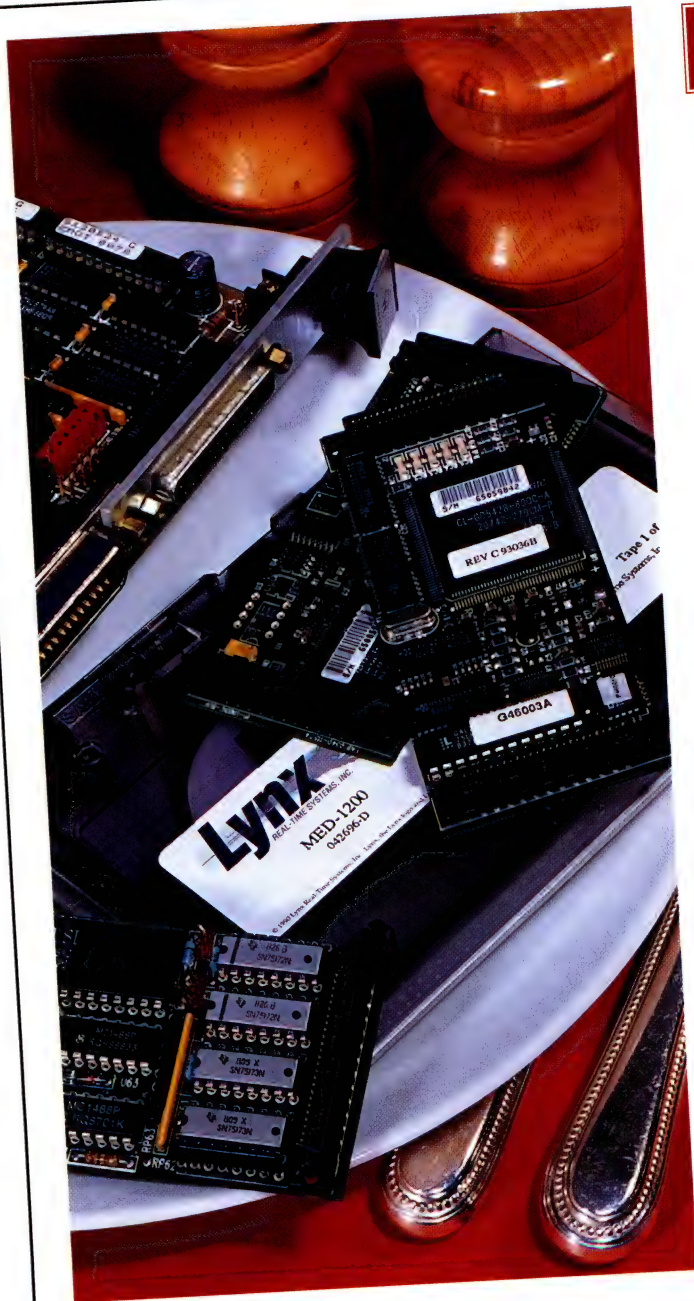
Knowing what goes with what and what to do to get the best result can be left to trial and error, but clearly a better approach is to involve the assistance of engineers who deal with such matters on a daily basis. In other words, you be the visionary and have VME Systems provide the answers you need.

### — TIMING —

Apart from the convenience factor of such assistance, it allows you to reach your objective in far less time. Case studies of projects have shown that it increases your competitiveness by reducing your time to market considerably.

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## New Single, Dual, and Quad FET-Input Op Amps

**OPA130** series of single, dual, and quad FET-input op amps are ideal for general-purpose, portable, and battery powered applications. They're easy to use and free from phase inversion and overload problems commonly found in FET-input op amps. Key specs: 500µA/amp low quiescent current, 1mV max offset voltage, 120dB min open loop gain, 20pA max input bias current, 1MHz bandwidth, and  $\pm 2.25V$  to  $\pm 18V$  wide supply range. OPA130 and OPA2130 (dual) are available in 8-pin DIP and SO-8 surface-mount packages. OPA4130 is available in 14-pin DIP and SO-14 surface-mount packages.

### OPA131

## New Precision FET-Input Op Amp Family

**OPA131** family of op amps offers excellent overall performance for general purpose applications. Available in single (OPA131), dual (OPA2131), and quad (OPA4131) versions, this innovative family supports the widest range of applications and package configurations. Key specs are: 4MHz bandwidth, 10V/µs slew rate, 750µV max offset voltage, and 50pA max input bias current. OPA131 (single) and OPA2131 (dual) are available in an 8-pin DIP and SO-8 surface mount packages. OPA4131 (quad) version is available in a 14-pin DIP, SO-16 and SO-14 surface-mount.

### OPA132

## High Speed, FET-Input Op Amp Family

**OPA132** family of single, dual, and quad FET-input op amps feature 20V/µs slew rate, 8MHz gain bandwidth, and excellent dc performance at a low price. These general purpose op amps are ideal for audio, data acquisition, test equipment, and communications applications. Other key specs: 50pA input bias current, 0.00008% distortion, 96dB min common-mode rejection, and 130dB min open loop gain. OPA132 and OPA2132 (dual) are in 8-pin DIP and SO-8 surface-mount packages. OPA4132 is in 14-pin DIP and SO-14 surface-mount packages.



**KENELEC**

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Arlec's component division began operating as *Arlec Technical Products Division* in July 1992, after trading under the name **Soanar** for the best part of three decades. In an about face, the division has returned to the old name and is trading once again under the **Soanar** banner. Arlec's component division, under the Soanar banner, is agent in Australia for NEC, Philips, Samwha, Actel, Seiko, Stanley, Super-tex, Thermalloy, Elna, Koa, Noble, Seojin, Cherry, Raytheon and Jungpoo. □

**BBS Electronics Australia** has been appointed by **Harris Semiconductor** as distributor and representative in the Australian region. BBS will sell the entire range of Harris Semiconductor products, including logic, linear and analogue ICs, MOSFETs and other power products. BBS's local activities are supported by the BBS Group of companies headquartered in Singapore. □

**Advanced Systems** has signed an exclusive agreement to supply **Kent Modular Electronic (KME)** monitors in Australia and New Zealand. KME are a specialist manufacturer of CRT displays for industrial, financial and medical applications. □

Zuken-Redac has signed an agreement with **UniCAD** to distribute UniCAD's UniSolve Products. Zuken-Redac is represented in Australia by *Randev Holdings*. This worldwide agreement links the UniSolve products with what the company claims is the world's number one CAD system, VISULA. The UniSolve tools expand Zuken-Redac's product offering to enable a full suite of tools for PCB design. □

**Clover Solutions** has formed an agreement with **Lucent Technologies** which gives Clover exclusive national distribution rights for WaveLAN which provides the capability to locate PCs almost anywhere. It is fully compatible with the leading wired LANs. □

**Adilam Electronics** has been appointed as a distributor of **Pascom Technologies'** Redback DAA components. Pascom offers a full range of Austel-approved telephone line interfaces. These products will be on display at Elenex this year. □

**Digital Graphics** has been appointed the Australian agent for **Dataman Programmers**, makers of handheld EPROM programmers. □

# Power station makes a splash

**W**estern Australia's first significant hydro-electric power station, located on the Ord River, scooped one of the 1996 Institution of Engineers' Engineering Excellence Awards at the ceremonies on 21 August. Held at the World Congress Centre and awarded by Victorian premier Jeff Kennett, the awards were decided upon by a panel of 100 judges.

The Ord River power station won due to its real value to the community, its significant commercial viability, the simplicity of its engineering solutions, and its delivery on schedule.

The \$73 million power station will

enable the closure of three diesel power stations, saving 60 million litres per annum of imported fuel, 170,000 tonnes of carbon dioxide emissions, as well as stopping the noise pollution of the diesels. The power is now being produced at less than 40% of the cost of the diesel plants.

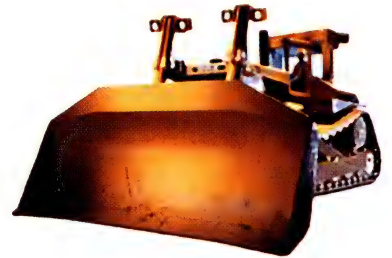
The 30MW Ord River power station supplies the Argyle diamond mine and surrounding towns and has the capacity to meet forecast demand in the northern Kimberley region for at least the next 30 years. It took 12 months to plan its construction and 14 months to build, with the first electricity being generated and sent to the Argyle mines in March 1996. □



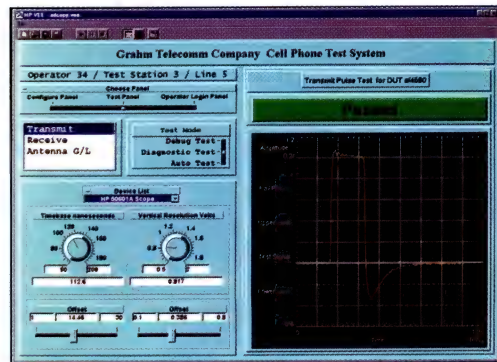
Powering up some sparkling customers — Ord River hydro-electric power station.



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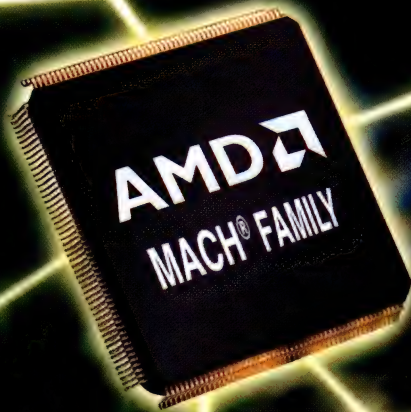
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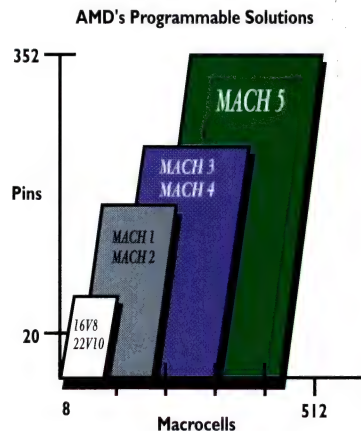


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# Siemens Ltd gets a new head

At the end of August Siemens Ltd invited many of its business contacts and associates to the Maritime Museum in Sydney's Darling Harbour, to farewell its retiring managing director Klaus Lahr, and to welcome his replacement Helmut Pekarek.

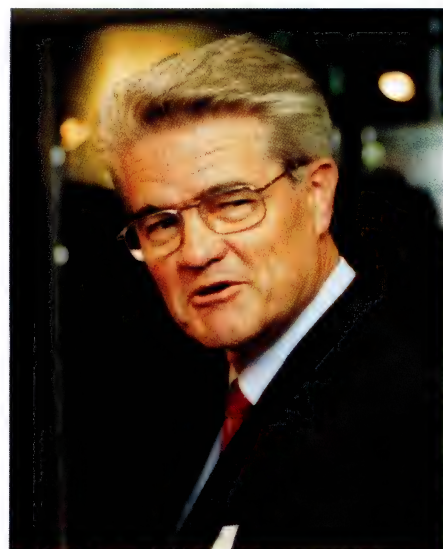
Klaus Lahr, based in Melbourne, headed Siemens Ltd for eight years, and will now become Chairman of the Board for the company. His colourful style and high-profile in the industry will mean he will be sorely missed. Dr Günter Wilhelm, a member of the central managing board of Siemens AG in Germany with special responsibilities for all operations in the Asia Pacific region, flew in for the event, and said that in spite of a difficult economic environment, Lahr had substantially increased Siemens Ltd's turnover and maintained its profitability. "Klaus Lahr has promoted Australia's interests and relationships in the [South East Asian] region and he has encouraged us to see our Australian business in the broader regional context," said Wilhelm.



Helmut Pekarek, new managing director, Siemens Ltd.

Dr Wilhelm also praised Lahr's high profile in the region, saying he has become "somewhat of an institution around Melbourne ... His interest in and support of the arts, in particular the opera companies of Sydney and Melbourne, is well known, and I am told that his post-opera speeches are, on occasion, more entertaining than the operas themselves."

Lahr will officially be replaced by Helmut Pekarek on October 1. With a Masters degree in engineering from the Technical University of Vienna specialising in applied physics, Pekarek joined Siemens in 1970, and comes to the Australian position from that of executive director with the company's power generation group. In his speech Pekarek said he was afraid he didn't possess the same flamboyant style as his predecessor, being more analytical and reflective, but he



Günter Wilhelm, Siemens AG

was looking forward to adapting to the open, informal Australian culture.

Wilhelm outlined the importance of the role Helmut Pekarek will be assuming, with \$5 billion planned to be invested by Siemens in the next 5 years. Wilhelm commented that "as this region holds 60% of the world's population and very soon 40% of the world electrical and electronics market, Asia Pacific is the key for further growth of a multinational company such as Siemens." □

## EDA Software Survey update

In the May issue of AEE we published a survey of major EDA software suppliers and their products. Unfortunately In-Circuit Design, which represents Veribest products, missed out on the May survey. Following are details of four of the products available from the company.

### In-Circuit Design

Suite 211 Princess Tower  
1 Princess St  
Kew VIC 3101  
Ph: (03) 9205 9595 Fax: (03) 9205 9410  
Contact: Barry Olney

### Product: Veribest Design Capture

Type: Schematic capture  
Platforms: DOS, Win 3.1, Win 95, Win NT, Unix  
Hardware needed: PC — 486, 16Mb RAM, 8Mb HD; Unix — Sparc 2-20, HP

700, Dec Alpha, 32Mb RAM, 8Mb HD  
Description: Veribest Design Capture is the front end tool for Veribest ASIC, FPGA, PLD and PCB applications. It is supplied with 25,000 library symbols. Binary compatible across all platforms.  
Price: \$1,351

### Product: Veribest PCB

Type: PCB design tools  
Platforms: Win 95/NT, Unix  
Hardware needed: PC — 486, 32Mb RAM, 100Mb HD, Unix — Sparc 2-20, Dec Alpha, 64Mb RAM, 100Mb HD  
Description: Microstation 2D/3D mechanical integration, signal integrity transmission line analysis tool, world's fastest shape-based router. Winner of 1995 PCB Design Conference Router Benchmark.  
Price: on application

### Product: Veribest PCB signal analyser

Type: Circuit simulation  
Platforms: Win NT/95  
Hardware needed: PC — 486, 32Mb RAM, 40Mb HD; or Dec Alpha  
Description: Veribest signal analyser provides transmission line simulation including crosstalk and Ibis models. The waveform display, wavescope, emulates a virtual oscilloscope during layout.  
Price: on application

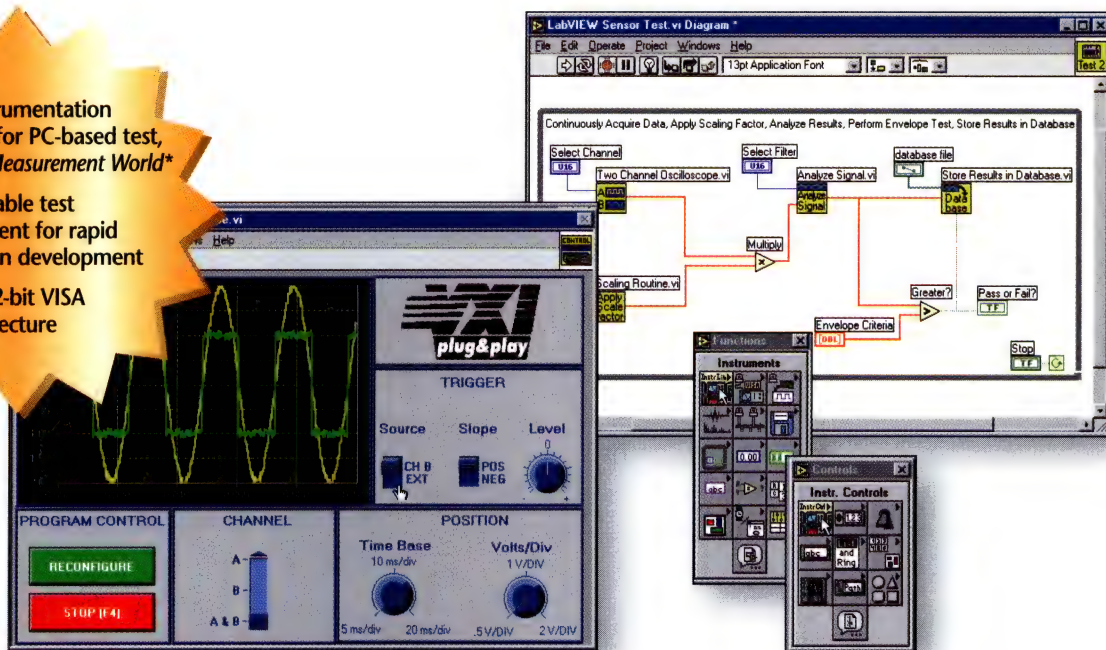
### Product: Veribest Analog

Type: Circuit simulation  
Platforms: Win 95/NT  
Hardware needed: PC — 486, 32Mb RAM, 50Mb HD  
Description: Veribest Analog offers superior simulation capabilities as compared to Spice-based simulators in terms of speed, accuracy and convergence.  
Price: \$13,530



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\*1995 PC-Based Test Market Insight Reader Study – *Test & Measurement World*, September 1995

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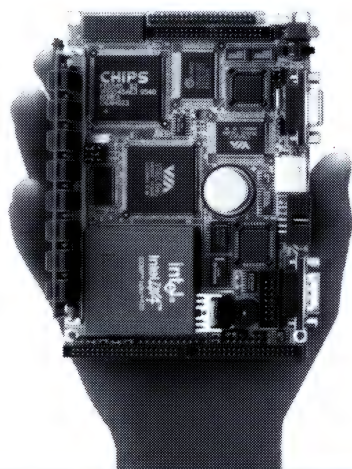
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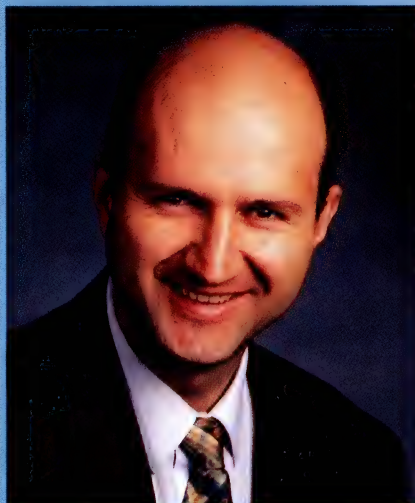
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## ON THE MOVE

Allied Telesyn International, world-wide provider of LAN connectivity components, has appointed **Stephen Justin** as regional technical support manager for Australia/New Zealand to support its expansion in the Asia Pacific region. Stephen is the first in what will be a team of engineers to provide pre and initial post-sales support to Allied Telesyn distributors and VARs. □



Stephen Justin

**Peter Brown** has joined national telecommunications consultancy Consultel Australia, as executive manager, technology and strategy. Peter was formerly general manager, telecommunications, with Fujitsu Australia. His tasks will involve tracking and participating in new developments in information technology and telecomms, with emphasis on the merging of IT&T and media. □



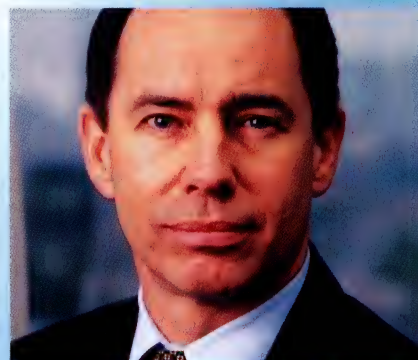
Peter Brown



Mike Quigley

Alcatel Australia has announced the appointment of **Mike Quigley** as its new general manager, reporting directly to managing director Ron Spithill. Mike has spent all his career with Alcatel, having started as a cadet engineer with STC as the company was then called. In his career he has been technical manager, quality director and general manager of network systems. □

Interleaf, provider of solutions for managing on-line information, has appointed **Charles Hense** as senior consultant in its Melbourne office. Charles will provide pre and post-sales support by helping customers integrate the company's products with applications already in use, to streamline business processes and improve management of business-critical information. □



Charles Hense

Gerber Systems Corporation, a US supplier of large-format laser plotters and automated optical inspection systems for the PCB market, has appointed **Lawrence Kong** as regional applications engineer for its Asian regional applied technology centre in Hong Kong. Lawrence is a CAM and software specialist with extensive experience in computer-integrated manufacturing and will be responsible for all pre and post-sales support of GSC's new portfolio of Valor CAM software products. □

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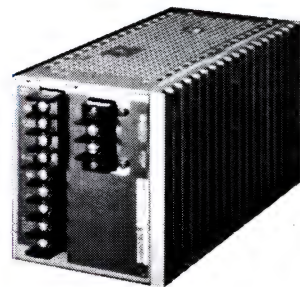
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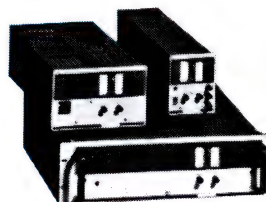
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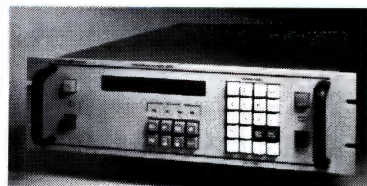


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# Quality workmanship

*Going beyond ISO 9000*

Certification to an internationally-recognised quality assurance standard is becoming an increasingly important part of electronics businesses worldwide. *Justine Geake* looks at some of the issues surrounding AS/NZS ISO 9000 series certification.

An article entitled 'The Successful Company of the Future' in a recent edition of *The Quality Magazine* quoted professional motivational speaker Tom Peters as saying that companies need to "go beyond quality to be assured of success in the future", quality certification merely being the "entry ticket to the game". The article quoted a major survey of US manufacturing companies which found that while most respondents rated themselves high in the quality stakes, they realised that they could no longer rely on quality certification to differentiate themselves in the market place. While we have yet to reach that point in Australia, its arrival is inevitable, with well over 10,000 businesses in Australia and New Zealand already being certified to the AS/NZS ISO 9000 series of quality standards.

The scramble to get the piece of paper has resulted in some companies cutting corners and trying to take an easy road to certified status. While this may have short-term benefits, long term it makes no sense, and is a result of a lack of understanding of the quality movement. Those companies which have fully embraced and understood the ethos of the quality standards have reaped measurable benefits, but this hasn't stopped the continuing flow of "lip service" companies through the certifying process. It would seem that part of the reason this has happened is that the standards and

the certification process themselves have allowed it.

The International Organisation for Standardisation (ISO) is a worldwide federation of national standards bodies

Standards Australia/Standards New Zealand Committee on Quality Systems to supersede the old AS 3900 series. The series is now known here as AS/NZS ISO 9000, and consists of three main standards for external quality assurance purposes, and some other guideline standards for internal use by businesses. The three external standards are **AS/NZS ISO 9001** — Quality systems — Model for quality assurance in design, development, production, installation and servicing; **AS/NZS ISO 9002** — Quality systems — Model for quality assurance in production, installation and servicing (which is the standard mainly used in the electronics industry); and **AS/NZS ISO 9003** — Quality systems — Model for quality assurance in final inspection and test.

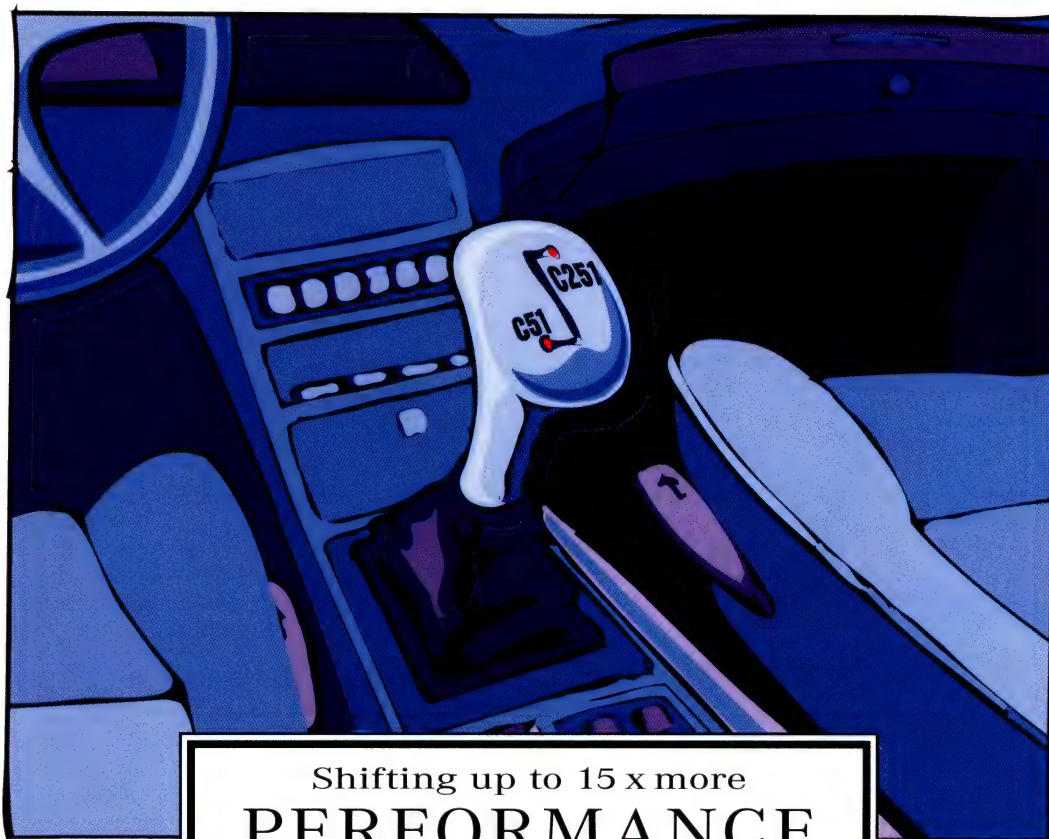
The AS/NZS ISO 9000 series is often summed up as a system for ensuring product or service consistency. If your product is good, the standard attempts to ensure it is consistently good. The Australian Organisation for Quality, a private training body, says that certification to the AS/NZS ISO 9000 series of standards means that a company has implemented a quality management system to an internationally accepted standard, providing assurance that goods and services will consistently meet the customers' needs and represent value for both customers and suppliers.

The standards do not however con-



which prepares international standards through technical committees. The ISO 9000 series of quality standards published by ISO was adopted by the Joint





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## NATIONAL INSTRUMENTS



Tony O'Donnell

*Tony O'Donnell, managing director* — "We saw certification as an important step forward towards giving customers better service. It has made the operation run a lot smoother and stopped a lot of things falling through the cracks. The management review was one of the most helpful aspects of the process. There was quite a bit of time and effort involved getting the certification — it took about 12 months to document things such as work instructions, manuals and policies, but I think it's been a very worthwhile venture."

tain any magic prescription for developing and turning out a "quality" product or service — a very common misconception. While the current (1994) version of the standard includes components that attempt to help companies improve the quality of their products, rather than just focusing simply on outcome consistency (a criticism levelled at the 1987

version), most agree that it does not go far enough in this area. Like Escher's drawing of a hand with a pencil drawing itself, the standard needs to undergo its own process of introspection and improvement.

Daryl Perry, quality manager with Sydney-based manufacturing company PC Assemblies feels the ISO 9000 series

falls short in several areas. While his company is certified to the AS/NZS ISO 9002 standard, he also works with an American standard called the QS 9000 series, which was developed by Chrysler, Ford and General Motors for the automotive industry. He claims QS 9000 incorporates ISO 9000, but goes beyond it with requirements such as a business plan and delineated continuous improvement.

Perry commented "ISO 9000 has little in it that forces you to *improve* the way you're doing things. QS 9000 has some really good extras that ISO doesn't have — you have to have a business plan, you must have documented processes for determining customer satisfaction, and things like feasibility reviews. For a business management standard, it's odd that ISO doesn't require you to have a business plan. QS 9000 puts a lot more emphasis on process control and making sure everything is right before you start building anything — not so much designing the product but, researching the best way to engineer things for manufacture. ISO should really be doing these things as well."

According to Perry "There is far more emphasis on process improvement than

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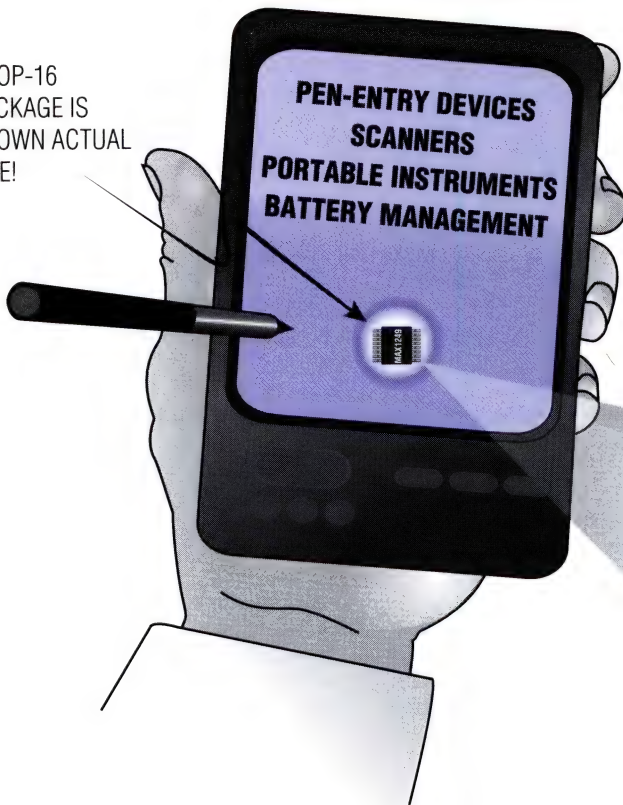


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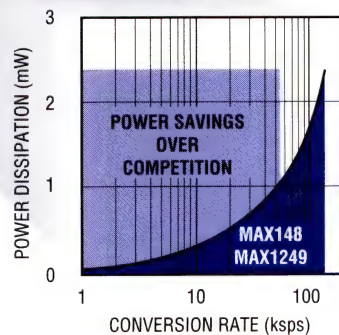


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in ISO as well." While it is said that one of the improvements of the 1994 version of the ISO 9000 series over the 1987 version is that it brought in a continuous improvement philosophy, Perry feels the way it has been done is not effective. "ISO requires statistical improvement control that a lot of people don't understand. It assumes that you are trying to improve things and includes concepts such as preventative and corrective action, but it is much less helpful than QS 9000. The latter is a much more rounded standard."

This view is corroborated by Malcolm Cameron, corporate manager ISO 9000 and QS 9000 activities with Quality Assurance Services. "QS 9000 is a better model for companies to work to. It makes business plans and system improvement mandatory. It also makes it mandatory for auditors to identify improvement opportunities; not just in instances of non-conformance. By being more delineated it forces ISO 9000 to be used properly. It makes it much more likely that a company following the standard will become increasingly cost-effective in all facets of the business. ISO could definitely be improved by incorporating the second part of QS 9000." He expects the next version of the ISO 9000 standards will appear before the year 2000, with elements of QS 9000 included.

A further issue raised by Cameron is the fact that the certification process is essentially binary — pass or fail. A company which has just scraped its way through with a minimum investment in time and money, gets the same piece of paper to hang in the foyer as one which has enacted a full and profound company change, totally embracing the quality philosophy. Perhaps a further direction for ISO to explore is a graduated certification system, with recognition of true excellence. This would give potential customers a better indication of how committed a company is to quality principles. Industry sources have indicated to AEE that in fact the majority of Australian companies seeking certification don't truly embrace the standards' spirit and objectives, being interested only in the immediate benefits of being a certified company, and attaining that status as quickly and cheaply as possible.

Part of the reason this sort of thing happens is that the basic philosophy behind quality standards and system improvement is only poorly or partially understood by the majority of companies pursuing quality certification. Malcolm Cameron of QAS said "We certainly have seen a difference between companies in their attitude to certification, from wanting to scrape through with only the barest minimum conformance to the require-

ments, to those that really take on the business objectives."

Lou Pascuzzi of Lloyds Register Quality Assurance (LRQA) commented "The attitude to quality in an organisation tends to reflect the attitudes of senior managers. There are those who run their business with quality as an integral part of the business strategy. Others try to fit quality in as an afterthought."

As might be expected with any process involving such large numbers and diverse types of businesses, the implementation of the standard is not without its significant problems as well. Daryl Perry pointed out the fact that ISO 9000 is a business management standard, but it is almost always administered within companies by technical staff who are not business-trained. These people may know little about customer satisfaction or how to run a business. Perry commented further that certain imposts of the standard can be very hard for smaller companies. "An enormous amount of document control and record keeping is involved and its questionable whether it's needed [in companies of that size]."

Maintaining certification can also have its problems, the most obvious being cost. A quality officer with a large power supplier commented that a large portion of the savings and increased profitability achieved by implementing a quality system was being eaten by the cost of getting the auditor in to maintain certification.

Bill Clayton, a quality officer with ANSTO's Engineering division outlined some of the problems it had with implementation of 9001 requirements, in a recent article in *Engineers Australia*: "...confusion and resentment surfaced over Quality Assurance Services' and our own internal auditor's interpretation of the standard. The interpretation of exactly how much documentation should be written, or how widely each clause should be extended, varied from auditor to auditor. Moreover, the very language used in the standard caused confusion....A whole new vocabulary had to be learned."

David Mallen of MCS Management Consultants agrees that vocabulary is a problem with the standards. "The single most important move to improving

## PC ASSEMBLIES

*Carol Jarvis, company director* — "We decided to seek certification because we realised that Australia was moving down that road and we wanted to be at the forefront of that advancement. We benefited internally from the quality process by formalising our procedures to the extent that we can now repeat any job perfectly at any point in time. Our processes are all repeatable. As each employee's tasks are now fully documented, we can slot anyone into any position and they will know exactly what to do — and we have had to do this.

"We found that achieving certification created a lot more work in the areas of documentation and reporting, but at the other end it has meant fewer defects. We haven't actually added up the overall costs or what savings there have been [from implementing quality processes], but the fact that our processes are now under documented control is the big benefit.

"We appointed a quality manager when we decided to go for certification and didn't use any external consultants as we felt they can be too distant from your particular processes. Our quality manager still has his hands full with maintaining the processes and improving upon them in consultation with staff, and keeping the documentation up to date, particu-

larly now that our staff has grown to 80."

*Daryl Perry, quality manager* — "Implementing the ISO standards is basically documenting what you do and doing what you document. We found the QAS auditors particularly helpful and knowledgeable, and to a certain extent you can use them as a sort of consultant. Auditors used to be the bogey man with the power of the almighty, but now they are more approachable and will help you achieve certification. The main difference between having quality systems and not is that instituting quality systems forces you to discipline yourself and gradually remove the local knowledge from the system. There can be resistance to this from [more insecure] employees who like to build their own unique knowledge so as to protect their position, but this is very bad from a company's point of view."



Carol Jarvis and Daryl Perry



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## HARTEC

*Andrew Jacobson, general manager —*  
 "We decided to go for certification as it was becoming industry standard, and we felt we needed it to be competitive. The process has certainly given us a different way of looking at the business we're in. On a personal basis it has allowed me to get a better picture of the deeper processes within the company — the interdepartmental relationships, where the work flows. We're currently re-flowcharting our processes to streamline things further. "Rather than just cowering under the quality stick, we have realised that

these procedures will make our customers happier. We're basically performing the same procedures [as before certification], but have a different perception of why we're doing them. It's made us develop a recognition of what the important procedures are — the ones that affect customers directly. Changing the name of our quality manual to 'customer service policies' helped increase staff acceptance and participation. Staff simply aren't motivated by quality for quality's sake, they have to see reasons and results."

general understanding of the quality standards and what they mean would be to remove the word 'quality'. It is too amorphous a term with too many different meanings. The AS/NZS ISO 9000 series of quality standards would be better termed 'business management standards'." One company *AEE* spoke to recognised the problem and part of its response was to rename its quality manual, calling it instead 'customer service policies'. According to the company, this made the whole thing more comprehensible to its staff.

One problem with the implementation of the standards in the "real world" seems to be misconceptions on the part of companies as to what the certifying bodies actually do when auditing a business. Malcolm Cameron of QAS said that the auditor's job was to "measure minimum conformance to the standard and the company's conformance to procedures

which are designed to achieve its objectives and goals. There is still a perception in the industry that we spend half the audit looking at documentation, however the audit process has moved away from that. We no put the emphasis on the areas of risk for that company and spend less time on the low-risk activities. We don't use the standard flatly - we concentrate on the parts that are of most use and relevance to that company."

Lou Pascuzzi at LRQA said that to gain certification a company's quality management system must be capable of satisfying contract conditions, legal and statutory requirements, ISO requirements and the organisation's own policy and objectives for quality. The assessment is structured to evaluate whether the organisation is managing its product or service quality effectively. Assessments commence by evaluating the pol-

icy and objectives of executive management. Business processes are examined to determine compliance with these objectives and the assessment is completed by examining audits, corrective actions and management review. Confidence in third party certification depends, to some extent, on an organisation being able to maintain its own systems. "Our assessment, and subsequent surveillance visits, verify that the organisation has the capability to maintain their system and work towards appropriate objectives. We sample all activities that fall within the scope of the assessment and can affect product or service quality.

"The greatest misconception is that assessors have some sort of specification on how they expect a system to be operated. As ISO is only a model, not a specification, it is flexible enough to permit organisations to develop ways of doing things that are efficient and appropriate to their unique situation. Many companies fail to tailor their system to gain maximum benefit. An assessors' only expectation is that the organisation has developed a system that is being implemented and is in control of quality. How they decide to do it is up to them."

Despite its imperfections, it is clear that the AS/NZS ISO 9000 series is producing results for those companies who have taken its requirements seriously. Achieving certification is only the start of building a true quality business — improving quality means constant review and analysis of systems and procedures.

Companies that just go through the motions of implementing a quality standard simply to get the piece of paper, without embracing the philosophy behind it, will not gain in the long run. □

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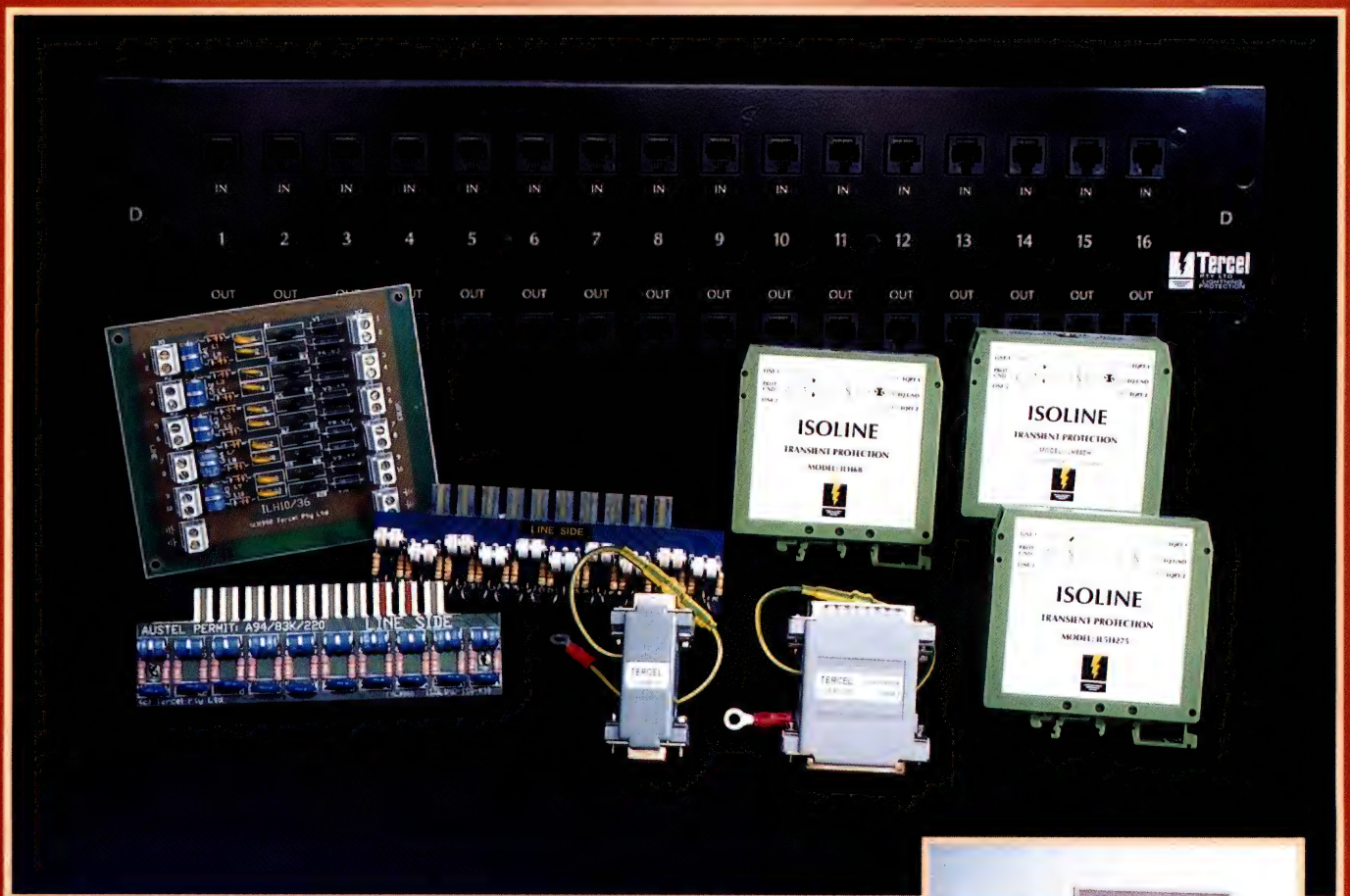




# AUSTRALIAN **Electronics** **ENGINEERING**

## **SPECIAL FEATURE**

**EMI/RFI, static control, lightning  
and protection equipment**



**Tercel launches silicon avalanche  
diode (SAD) protection for power,  
communications and lightning.  
Page 36**





# EMI/RFI, static control, lightning and protection equipment

This month's product survey features the latest in products and equipment for the protection industry. For more information on any item, complete the Enter Card on pages 26 & 70 of this issue.



## Spring-clipped planar capacitor arrays

Tri Components has available a new option for Syfer's planar capacitor arrays. They can now be supplied with spring clips in each hole, thus avoiding the need to solder directly to the ceramic array. Manufacturers of filter connectors will appreciate the quicker assembly procedure and the increased yield resulting from this method of incorporating planar arrays in connector shells. As well as the consequent reduction in the cost of assembly, the spring clip allows slight movement between a contact and the planar — without mechanically stressing the planar.

The arrays come in a range of capabilities, such as mixed capacitance values and COG, X7R and Z5U dielectric materials. Array shapes can be circular, rectangular or custom. [792](4861)

**ENTER 3600 ON CARD**

## Grounded work station

Allendale Static Control has available a grounded work-station kit ready to install onto any bench top. It is available complete with a conductive mat, wrist strap, shielding bags, conductive tray, conductive foam, and a grounding cord to be connected to earth. This ensures that personnel are grounded at all times. All components are also available as single items. [2150](10801)

**ENTER 3601 ON CARD**



## EMC testing, planning and documentation package

Emona Instruments has available an EMC diagnostic and testing solution for in-house pre-compliance testing. Seaward's testing software and hardware solution is a package of three related products, comprising Expert Consultant, a unique software package that guides the operator through





EMC legislation and design diagnostics and allows users to provide detailed documentary evidence of EMC-compliant procedures and testing programs; Sceptre, a high-performance spectrum analyser with in-built LISN (line impedance stabilisation network) for conducted emission testing, and Mace - a mains interference simulator capable of applying voltage dip, fast transient and electrostatic discharge tests to IEC standards.

Using this in-house testing solution, users can decide on self-certification of products or approach an accredited EMC test house with much greater confidence. [1270](2)

**ENTER 3602 ON CARD**

## Ozone-friendly nickel screening compound

HK Wentworth has announced Electrolube's new version of its proven EMI/RFI nickel screening compound to help manufacturers comply with the imminent regulations concerning EMC. The compound has been developed as an extremely efficient EMI/RFI screening coating which produces Faraday cage protection for most applications.

Now 100% ozone friendly, the compound is an electrically-conductive coating based on nickel powder in an acrylic carrier resin. It will adhere to a wide variety of substrates, including ABS and many other plastics and is available in aerosol and bulk forms to provide a screening solution for both large and small scale production. The coating becomes touch-dry after 15 minutes and achieves maximum conductivity after 24 hours. It has excellent surface resistivity, attenuation levels and the ability to coat complex shapes. [2300](1992)

**ENTER 3603 ON CARD**

## EMI gaskets

Carinda International has available Schlegel EMI gaskets made from a compressed urethane-foam core encapsulated within silver-plated nylon rip-strip fabric which is bonded to the foam as an integral part of a patented manufacturing process.

The resilient urethane is formulated to provide minimum closing force with maximum attenuation. The result is a cost-effective way of reducing EMI/RFI for existing products and for new product designs, in order to conform to revised industry standards.

The excellent memory of urethane foam permits it to return to its original shape after cycling. Secondary environmental benefits include light, dust and noise sealing, as well as providing a solid protective barrier against the intrusion of moisture and humidity. There are over 20 standard profiles to choose from. [2270](12635)

**ENTER 3604 ON CARD**

## EMC powerline filters for 3-phase variable speed drives

Westinghouse Industrial Products has available Schaffner's state-of-the-art EMC filtering solution of three-phase industrial frequency inverters. The FN258 series of filters offers a universal high voltage rating of 480V, meeting the requirements of variable speed motor drive manufacturers and users around the world.

The new filter, which is available in a family of nine variants to cover a current range from 7 to 180A, greatly simplifies the task of making variable frequency drives comply with EMC regulations through universally high specifications. It allows a single filter solution to be specified regardless of where the equipment is to be used. In particular, standard temperature rating of 50°C, 10° higher than the industry average, allows users to select the correct filtering solution without having to de-rate specifications to match actual working conditions, in countries such as Australia.

The filter is easy to mount with a small footprint mechanical design using a book-style housing in preference to the usual box shape. [620](2815)

**ENTER 3605 ON CARD**



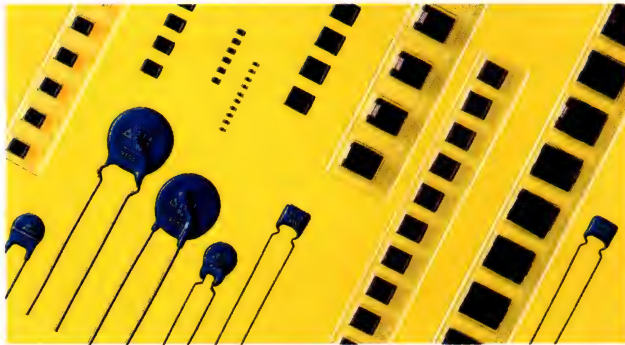


# SIEMENS

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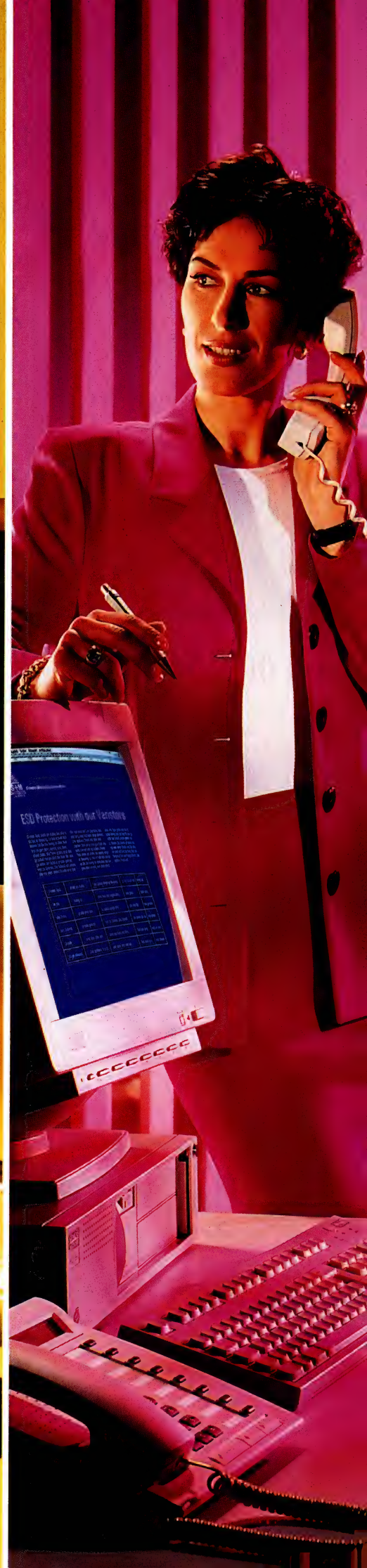
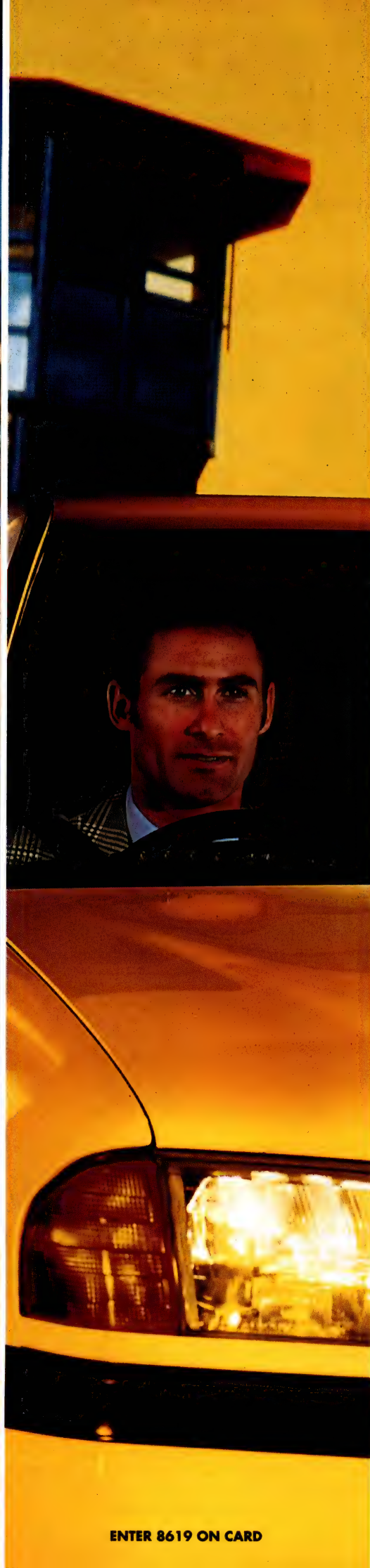
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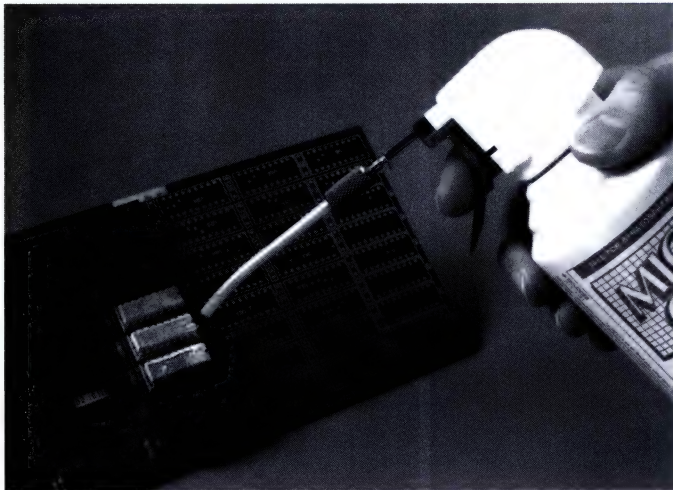




ENTER 8619 ON CARD



## Universal metal straw dispenser



Solder Static has available Microcare's newly-designed universal metal straw dispenser which sharply reduces ESD voltage when used with canned solvent/duster sprays for cleaning PCBs. StatZap is a patented, slender 6in long stainless steel Teflon-clad tube, with swaged tip and a trigger control. Used in conjunction with a grounding wrist strap it can dissipate static electricity to less than one-tenth of that of ungrounded plastic straws. The swaged tip also helps create a corona field around the spray exit to further dissipate static voltage and maximise personnel safety. The ShockShield extends beyond the tip of the StatZap and acts as an insulating barrier against inadvertent electric shock. The entire unit is designed to replace the common plastic straw appendage which is attached to many solvent spray cans.

StatZap may also be used on most spray cans, freeze sprays and canned air, regardless of manufacturer. [2300](9209)

**ENTER 3606 ON CARD**

## 1000V professional safety tools

Cable Accessories has introduced a range of 1000V professional safety tools to supplement its existing range of crimping equipment. The tools have been tested to 10,000V in accordance with internationally-recognised standards. All have ergonomically designed non-slip wide bubble handles to provide maximum grip and comfort. They are manufactured from drop-forged vanadium steel, and jaws have been precisely machined to ensure a strong grip.

The range includes side cutters, with flush cutting and bevelled blades for soft and hardened steel wires; long-nose pliers with serrated inside jaws and bevelled side cutting blades; electrical pliers with serrated nose grip and bevelled side-cutting blades, and another version with diamond pattern nose grip, radiused chain grip, extra long cutting blades and indent crimping.

Completing the 1000V range is a set of fully-insulated screwdrivers which includes four slotted screwdrivers, two Phillips head and two Pozidrive screwdrivers insulated in accordance with Australian Standard AS3527.2. [2520](5484)

**ENTER 3607 ON CARD**



# The Tercel "Tool Kit" version II - Out Now!

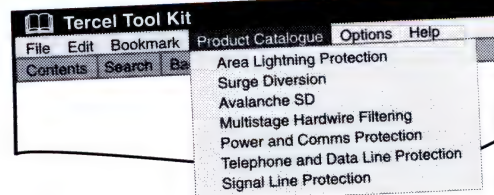
The Tercel "Tool Kit" had an overwhelming response. And so...Tercel proudly launches the new and improved Tercel Tool Kit, Version II. The latest release of the comprehensive design and product portfolio for all power, communication & lightning protection.

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- ◆ Exciting In-house Education and training courses
- ◆ New installer program with sound and lightning

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**ENTER 8620 ON CARD**





## OPEN DAY AT ELECTROMAGNETIC INTERFERENCE TEST SITE

*Austest Laboratories* have for some time made available their EMC open area test sites for Engineers requiring pre-conformance testing of prototype and pre-production samples for radiated and conducted emissions, in accordance with various standards covered by the Spectrum Management Agency's new EMC regime.

Although there is a proliferation of "EMC experts" jumping on the EMC bandwagon, much of the information available lacks a practical perspective. With the on-set of the EMC regime, it's important for engineers to have an understanding of the practical aspects and methods that go into electromagnetic interference testing.

Austest is scheduling a series of 1 day visits to their open area test site (OATS) during November, which will include:

- An actual test of a non compliant product, with our test engineer modifying the item for compliance.
- Examining the range of pre and post production modifications available.
- Details of typical test equipment used, including low cost alternatives.
- Factors influencing test results including losses, gains and site characteristics.
- How to determine the appropriate standard and limits, particularly when the product performs various functions.

Austest is a NATA and Austel registered test house for performing EMI measurements to AS/NZS3548 (CISPR22) for information technology equipment. Standards for Industrial, Scientific, Medical and Domestic/Household items will also be covered.



- |                     |   |
|---------------------|---|
| <b>When:</b>        | Bookings now open for limited days in November.   |
| <b>Who:</b>         | Managers, Engineers, Importers and Manufacturers.   |
| <b>Fee:</b>         | \$500   |
| <b>Restriction:</b> | 5 people per day only.  |
| <b>Outcome:</b>     | You will gain valuable and relevant information to enable a total EMC strategy for your business. |

The day includes a light lunch and refreshments.

Contact **Gordon Slimmon** at Austest for further details.

### **Austest Laboratories**

4/87 Reserve Road, Artarmon, NSW 2064

Telephone: 61 2 9437 4500

Facsimile : 61 2 9437 4600

**WEB PAGE:** <http://www.austest.com.au>

**Email:** [Austest@mpx.com.au](mailto:Austest@mpx.com.au)

ENTER 8621 ON CARD



## Mains power line filters



Braemac has available a range of mains power line filters from Bulgin which help equipment manufacturers meet new requirements of the impending EMI and RFI legislation. The filters can be customised to meet the individual applications of new and existing product designs and use only internationally-approved self-healing capacitors and quality inductors.

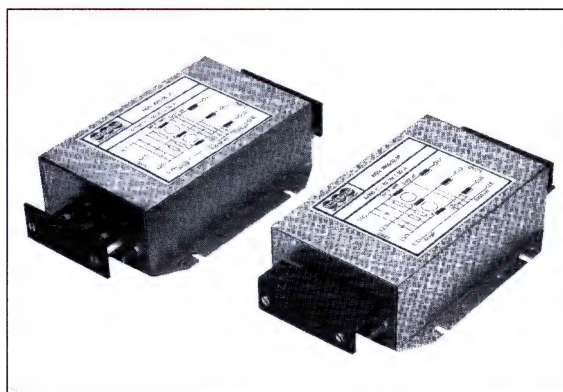
A diverse selection of panel mounting types is available with the option of unfused, single or dual-fused types. There is a choice of chassis, bulkhead and PCB types to augment the panel mounting options, with ratings from 1-10A, 250Vac, 50-400Hz. The range also includes earth-line choke, low leakage (medical) and high performance variants with the option of integral "bleed" resistors and VDR surge protectors.

The new customisable polysnap module program will benefit OEMs requiring filtered power inlets/outlet modules incorporating single or double pole switching, voltage selection, power in or power out fusing, or power on indication. [620](4274)

**ENTER 3608 ON CARD**

## 3-phase filter for spindle drives

Braemac has available the Konfektronic 3000 3-phase filter, specially developed for the noise suppression of speed regulated spindle drives, often



used in tool machines. High quality components and precision manufacturing have resulted in very good attenuation characteristics with a working current of up to 32A. Lower current versions are also available on request. [620](4274)

**ENTER 3609 ON CARD**

## PCB time-lag microfuse

Philips Components has released a new addition to the broad range of Bussmann PCB fuses, the ETF series. This is a radial-leaded time-lag microfuse rated at 250Vac, in ratings from 80mA to 6.3A.

Designed initially for use in lighting ballasts and other industrial applications, the Type T pattern is meeting with success in Europe as it is widely regarded as the most convenient package for automated pick and place equipment, according to Bussmann sources. The ETF series carries SEMKO and VDE approvals up to 4A rating and UL-recognised and CSA-certified.

They are available in both short (4.3mm) and long (18.8mm) leads. Dimensions are 8.35mm x 7.7mm high. [801](4180)

**ENTER 3610 ON CARD**

## ON THIS MONTH'S FEATURE COVER

Tercel's new innovative range of protection devices is based on leading-edge technology of Grade A, 5% Silicon Avalanche Diodes (SAD), taking Tercel to the forefront of overvoltage protection in Australia.

The unique properties of the bipolar SAD gives protection systems based on it many advantages over those based on current-generation MOV componentry.

- Bipolar protection — Both positive and negative transients are clamped without the need for other devices such as inductors and capacitors.
- Response time — SADs have a very fast response time, reacting to transients in less than 5 nanoseconds.
- Life-long protection — Compared with MOVs which degrade over time, SADs continue to perform year after year without degradation, maintaining a high level of performance.
- Lowest clamping available — The SAD's clamping ability is superior to any other product or component (proved by independent testing).
- Small profile — In comparison to large series filters, the Avalanche Advantage range has significant size and weight advantages.

Contact your nearest Tercel office and ask for the latest version of the Tercel Toolkit. This Windows-based help file has all the technical information and supporting documentation on all Tercel's range of products and services. **ENTER 8622 ON CARD**

**AUSTRALIAN  
Electronics  
ENGINEERING**

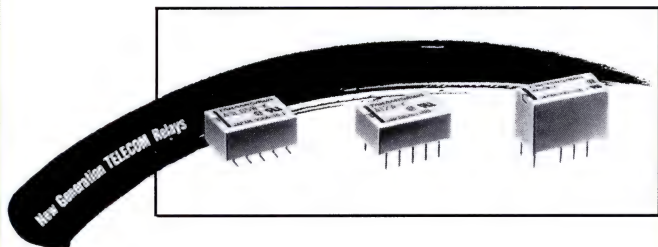
**SPECIAL FEATURE**  
EMI/RFI, static control, lightning  
and protection equipment

Tercel launches silicon avalanche diode (SAD) protection for power, communications and lightning.  
Page 36



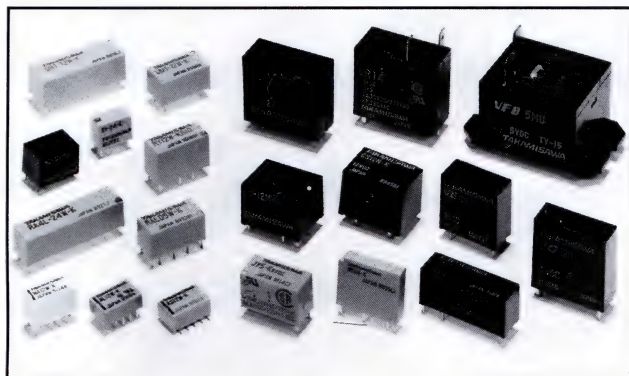
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# THE ONE BOX SOLUTION

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ENTER 8624 ON CARD



## Portable appliance tester



Emona Instruments has available Seaward's PAT1000S portable appliance testers for simplifying the testing procedures and ensuring error-free results by running automatic test sequences and recording full test results. The tester guides users through a sequence of tests that include earth continuity, insulation leakage, fuse test, load and flash tests plus an operation and visual inspection log.

By connecting an appliance to the tester, tests can be performed in either automatic or manual sequence. Alternatively a user-specified code can be entered that adjusts the tester's pass/fail parameters to suit the standard and the conditions applicable to the particular appliance, making testing virtually error-free. Test results can be subsequently logged by the unit's record-keeping software PAT+, for later review and printout. The software holds information such as equipment registers, check lists, forward-planning facilities, test recording and next-test-due dates, failure/untested item reports, equipment history and test certificates. [1270](2)

**ENTER 3611 ON CARD**

## SCSI interface circuit protection

Avnet VSI has available the SM16LC unidirectional low-capacitance transient voltage suppressor (TVS) array designed to provide ESD and EFT protection for SCSI interface IC components with up to 8 lines. This series has a capacitance of less than 25pF for the protection of high-speed data and transmission lines. Other applications include PCMCIA cards, data acquisition boards, high speed data communication circuits and fast Ethernet circuit applications.

Specific voltage tapes are available from 5.0 to 15.0V. Each data line is independent of the other to provide line isolation and eliminate transmission line noise (crosstalk). The design of the low-capacitance circuit provides for a linear capacitance value over the operating voltage range of the circuit. Both positive and negative transients are clamped, positive transients to the device voltage and negative transients to less than one volt. These devices are designed to meet both the IEC 801-2 and the 801-4 transient immunity require-

ments. SM16LC provide the lowest clamping voltage of any known protection element while maintaining signal integrity. [690](65)

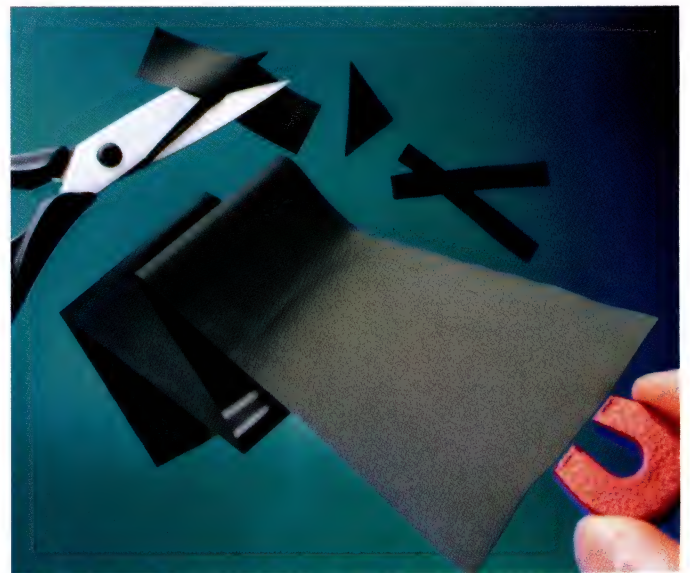
**ENTER 3612 ON CARD**

## Personal monitor checker

Rojone has announced the availability of the Loral/Narda model 8804 Nardalert Checker, designed for use with Narda's microwave band personal monitors that operate from 1GHz to 100GHz and have alarm thresholds of either 1mW/cm or 5mW/cm. Users can regularly check the performance of their personal monitor with a calibrated RF field with this simple-to-operate, low-cost unit. [1270](3245)

**ENTER 3613 ON CARD**

## Flexible FPC ferrite film



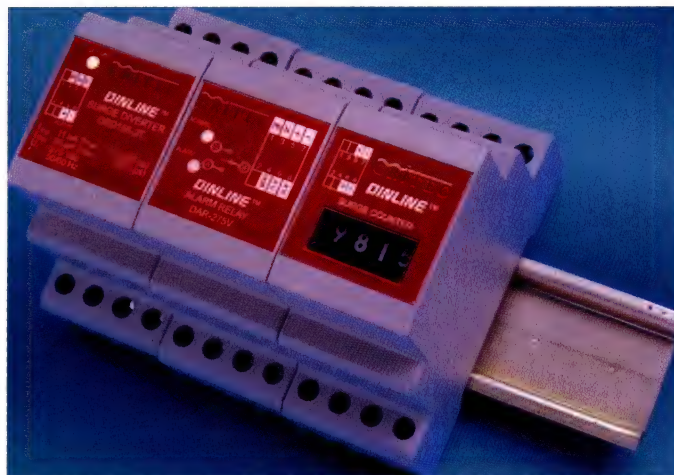
Siemens has released a flexible film made of FPC ferrite material, developed and manufactured by Siemens Matsushita Components with patent pending. Unlike conventional ferrites, FPC (ferrite polymer composite) can be processed into thin, flexible film.

Because of the film's shielding effect, it is suitable for applications in electromagnetic compatibility. Flexible coils, multilayer inductors, security systems for department stores and field focusing with flat coils are other applications. The film offers stable magnetic properties and is 40% lighter than common ferrites. It also features high mechanical load capability and mechanical insensitivity. The geometry of the film can be varied in any way, so custom solutions such as punched parts or self-adhesive films are possible. At between 0.1 and 0.4mm the film is so thin that its volume when incorporated can virtually be disregarded. [1450](1562)

**ENTER 3614 ON CARD**



## DIN mounted surge protector



Global Lighting Technologies has announced its new Critec DINLINE family of surge diverters and filters. These units offer protection from power transients and can be installed on 35mm DIN rail mountings.

Single-mode DINLINE surge diverters provide protection between two terminals and can be configured for Ph-N, Ph-E or N-E protection. They are suitable for installation in the switchboard near the MEN point.

Three-mode units provide simultaneous protection for Ph-N, Ph-E and N-E circuits and are suitable for protection requirements remote from the MEN point.

For three phase circuits, multiple single phase units can be installed or an individual three phase module is available.

DINLINE surge filters protect sensitive electronic circuits by filtering the clamped waveform, following the shunt protection stage, to reduce the rate of voltage rise reaching equipment. A range of filters is available for load currents up to 20A. For larger current loads Critec's Proline SRF series provides protection.

All DINLINE surge diverters and filters meet ergonomic standards for DIN rail mounted products and comply with DIN 43 880. The 2M, 4M and 8M enclosures have fingerproof terminals making them suitable for distribution boards or switchboards.

Most diverters and filters feature indicators to confirm their protection status and a matching surge counter unit is available to record the number of pulses diverted by the unit. A retrofittable DINLINE alarm relay module is also available for applications which require remote sensing. [2150](13132)

**ENTER 3615 ON CARD**

## 3.0 joule multilayer varistor

Veltek has available from AVX a 3.0 joule transient energy rated version of its TransGuard multilayer varistor which effectively doubles the previous energy rating in this range. Designed and built at the request of European automotive man-

ufacturers, the VC1210 18P390 in a 1210 chip package (3.2mm x 2.5mm) features a 500ampere repetitive peak current rating (8 x 20ms) and a transient energy of 3.0 joules with 10/1000µsec pulses applied. Peak power ratings are 50Kw for a 10ms duration pulse and 3K for a pulse having a 1ms duration. With this performance the device could also be suitable for many modern telecomms and security system applications.

The 18V working voltage and 30V maximum clamping level were designed in order for the device to be used in 12V automotive systems which required suppression of inductively generated transients. This multilayer structure device has a capacitance of 4.7nF which, combined with the "lossy" typical nature of the zinc oxide dielectric, provides excellent RFI suppression.

Despite its high energy rating, the device retains the MLV's sub-nanosecond response time enabling it to effectively protect against ESD impulses conforming to IEC 801-2 waveforms.

Prime automotive applications of this device are ABS systems, small motor transient suppressions in wipers, fans, seat adjusters, window lifts, sun rooves, engine management units, car security and keyless entry systems. The device is also expected to find many non-automotive applications such as in earth leakage and other relays, mobile telephones, fax machines and alarm systems. [840](3946)

**ENTER 3616 ON CARD**

## Two-hand anti-tiedown controls

Micromax has available Banner Engineering's Duo-touch two-hand anti-tiedown controls, used to protect the hands of workers who activate industrial machinery. When used with two normally-open inputs such as Banner Opto-touch switches, these controls require the use of both hands operating both inputs simultaneously to start and maintain a normal machine cycle. This limits the ability of the operator to place either or both hands in the hazardous area of the machine during a machine cycle.

The system monitors itself in two ways, assuring that all safety functions are maintained, even if a component fails. Both inputs must be closed within 500ms of simultaneous actuation for the output contacts to close. This design eliminates the possibility of an operator "tying down" one of the input devices. For additional safety, Duo-touch uses triple-redundant output contacts to assure proper operation, even with welded contacts, defective coils, control cable breaks, short circuits or non-simultaneity of actuation.

The controls conform to European standard prEN 574 for two-hand controls, and to UL category 491, device type 4, when used to control part revolution clutched machinery. They are very compact when compared with similar devices and are available in three supply voltages. They are highly immune to EMI, RFI and ambient light interference. [2150](5472)

**ENTER 3617 ON CARD**



# Overvoltage protection using silicon avalanche diodes

As the density of TTL & CMOS devices increases, the need for solid state suppression technology rises. This article looks at the way silicon avalanche diodes are used in protection systems and the pros and cons of different design techniques.

**S**ilicon avalanche diodes (SADs) have been used in the transient and overvoltage protection device (TOPD) field for many years. The extreme linear clamping characteristics, very low 'on-resistance', and phenomenally fast response time make the SAD one of the preferred technologies in the TOPD field. Frequently, some manufacturers of TOPD devices advertise the use of SAD technology in their design. There is, however, no explanation of the suppression module layout and role of a SAD in the circuit. The three most common design approaches of pure silicon avalanche diode-based TOPD devices are outlined in this article.

The first silicon PN-junction device designed to clamp relatively high power, short duration overvoltages (ie transients) was the unipolar avalanche suppression diode. Unipolar suppression diodes have similar VI characteristics to zener diodes but are designed with greater power handling capabilities. When the reverse voltage across these diodes exceeds the designed breakdown voltage, their impedance quickly changes in order to maintain a constant voltage. When the unipolar diode is forward biased it conducts current with the familiar silicon forward conduction voltage of 0.7 volts.

Unipolar diodes could not be placed directly across the sinusoidal utility powerlines because their forward conduction voltages of 0.7 volts is too low. This low conduction state would not allow one half of the sinusoidal voltage to pass because

the diode is in the forward biased mode.

## Switching networks

One method of implementing protection with unipolar diodes incorporates two banks of SADs, one for the negative portion of the sine wave and one for the positive. A pair of switching networks is then used to place one bank or the other on line. Each switching network incorporates a 'sense leg', which is a small energy rated SAD in series with blocking diodes. Sense leg current will conduct if the voltage exceeds 120% of the peak sine wave, effectively sensing over voltages. This current activates a trigger network, which is then triggers a Silicon Controlled Rectifier (SCR) in series with a larger energy rated bank of

unipolar SADs. Each SAD bank is set to clamp just above the peak of the sine wave. When the voltage falls below the 120% level, the SCR switches off (see Figure 1).

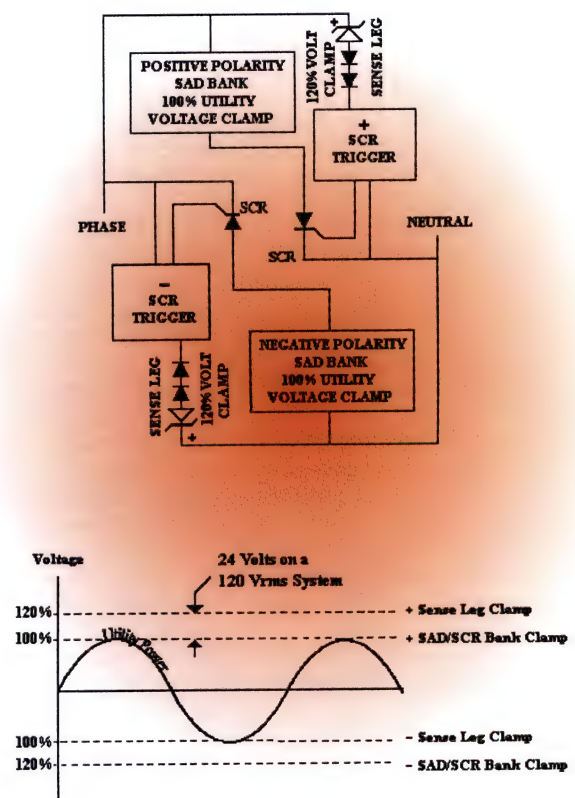


Figure 1. Protection using unipolar diodes.



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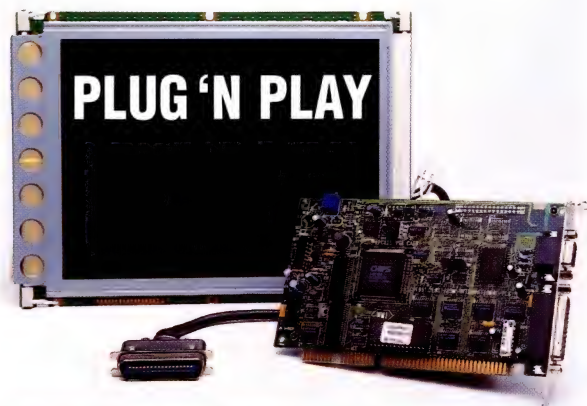


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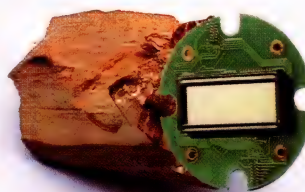


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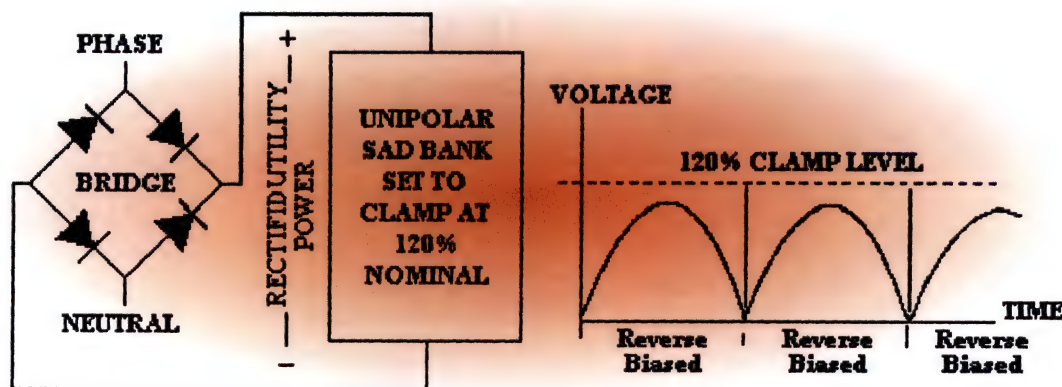


Figure 2. Protection using unipolar diodes and bridge rectifier.

Design challenges with this method stem from the small energy rating found in the sense leg, the time-lag before the main joule rated SAD bank is activated, and the current capability of the SCR.

A time-lag exists because of the speed of the SCR trigger and the turn on time of the high current SCR. During the fast rise-time transients, the only protection initially is in the low joule rated sense leg until the SCR triggers. Sense-leg energy ratings are often exceeded in this lag-time and the SAD fails in a short condition. After the sense leg fails short, the low-clamping main SAD bank is continuously on line. When the utility voltage rises above nominal, even by as little as one or two percent, clamping of the utility power occurs. When this happens, power feeding the protected equipment is distorted, often causing equipment malfunction.

Transients are often capable of driving several thousand amperes through a surge suppression device in several microseconds. Junction reaction time for the SAD is in the sub-microsecond range. If this quick turn-on time is taken advantage of in the design of a suppression device, all components must be as fast or faster than the SAD.

Therefore, SCRs used in series with the fast SAD technology will need to react as fast or faster than the diodes. Area of the SCR junction determines the current capabilities and response time of the device. As the area is increased, the current capabilities are also increased but the response time is decreased. When a fast SCR is chosen to match the speed of the SAD it will fail in a short circuit condition during high current transients due to its limited junction area. Once the SCR has failed short, one half of the AC

sine wave will be shunted to ground. This condition will either clear the fuse/breaker in line with the suppressor or quickly burn out the SAD stage. In either case, all suppression is lost. A high current, large junction SCR will handle most of the higher current transients but will inhibit the response time of the total system, allowing the voltage to exceed the clamp levels during many transient conditions.

The theory behind a lower nominal clamping (100% nominal) SAD bank is that it will clamp lower than a SAD bank designed to initially clamp at 120% of utility nominal voltage. The difference between the 100% nominal voltage clamp and the 120% nominal voltage clamp on

through is comparable with the switched lower initial clamp design described in the first approach discussed, even though the initial clamp level is set at 120% of nominal utility voltage. This is because the SAD with its high energy rating is continuously on-line.

Design challenges when using this approach arise because of the current capabilities and response time of the bridge rectifiers. The current conducted during a transient can exceed many thousand amperes, and the bridge must be able to handle this.

Rectifiers capable of handling high currents are costly and have large physical dimensions. If several smaller rectifiers are paralleled to replace the one

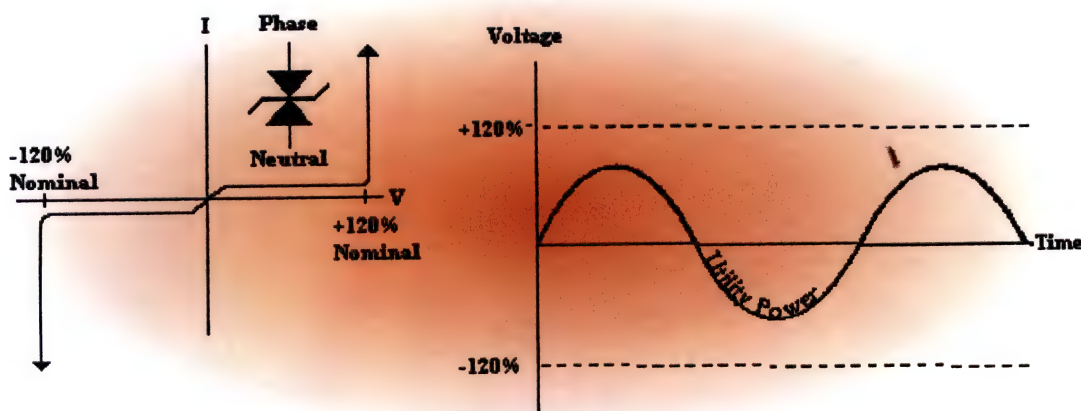


Figure 3. Bipolar diodes can clamp both positive and negative transients.

a 240Vrms line is 48 volts. This small difference in clamp voltage is difficult to justify when coupled with the lost reliability associated with the small joule rated sense leg.

## Bridge rectifiers

A second design approach incorporates bridge rectifiers to overcome the unipolar SAD problem (see Figure 2). Voltage rectification keeps the unipolar diode in

large rectifier, they must be closely matched in order to handle the expected high currents. Paralleling rectifiers to share current is difficult due to the low on-resistance associated with a forward biased diode. Also, forward turn-on times associated with bridge diodes hinder the extremely fast response time of the suppression diodes.



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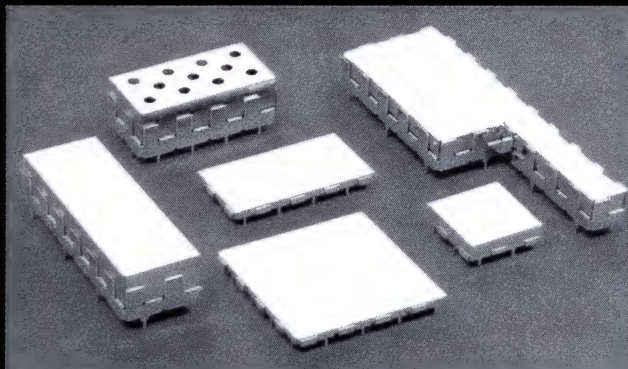
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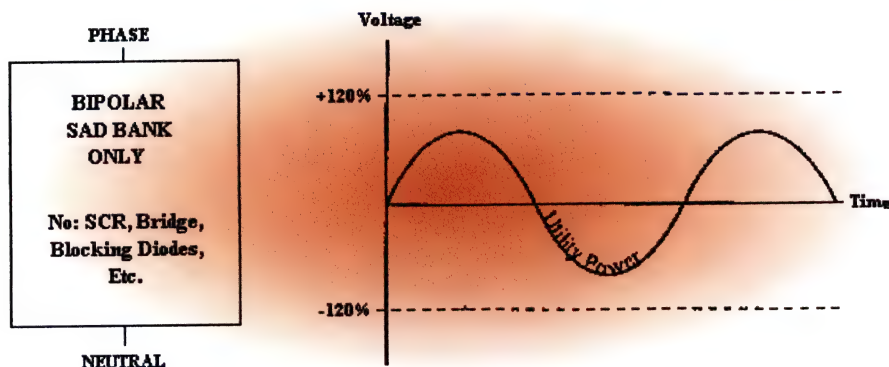


Figure 4. Bipolar SAD banks need no external components.

## Bipolar diodes

The natural evolution of suppression diodes led to the now popular bipolar diodes. These diodes are constructed so that they are capable of clamping either positive or negative voltages without any external components to impede their fast response time (see Figure 3). Dies for these diodes are capable of dissipating their rated energy in both the positive or negative polarities. For example, if a bipolar suppression diode is rated at 5 joules, it can dissipate that much energy in either the positive or negative polarities. With a dual bank unipolar design, it would take two 5 joule diodes, one in each polarity, to match the overall energy capabilities of a single bipolar 5 joule diode.

With the elimination of SCRs and bridges from the circuit, the fast response time of the avalanche diodes is not impeded by slower components (see Figure 4). When these diodes are matched in paralleled series strings, and their initial clamp level is set for 120% of nominal utility voltage, they easily achieve the lowest voltage let-through levels compared with designs using unipolar SADs.

## Questions to ask

All of the design factors discussed will influence the performance characteristics of silicon avalanche diode based TOPDs. Before deciding on a TOPD, system designers should seek answers to the following questions about a module:

- Is the main TOPD module pure silicon avalanche diode based?
- Are there any switching components used which will delay response of the TOPD to voltage transients?
- What is the energy rating of the SAD suppression technology (this must be per-phase per-polarity, and not the sum of positive and negative polarities. Energy can flow in only one polarity at a time, therefore energy figures that add polarities are misleading)?
- Are there any back-up modules incorporated in the system design in the event the SAD module self-sacrifices?
- And finally, are the SAD modules independently fused due to the short circuit condition which will occur if the SAD suppression module must self-sacrifice?

Since there are no recent design patents on the above subject, each manufacturer of pure silicon avalanche diode-based TOPD should provide the end user with specifics related to the TOPD design concept. ☐ This article was supplied by Tercel and was adapted from an article included in the Tercel Tool Kit, a catalogue and information program available on floppy disc for Windows-based PCs.

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## Also in this issue:

- Launch of Tektronix' latest 60MHz & 100MHz Scopes. "Designed to replace the low-cost analog scope."
- Type II Sound Level Meter
- EMC Spectrum Analyser
- The Popular EWB Circuit Simulation Package

# EMONA News

Electronic test equipment & software for industry and education.

## TV & Satellite Instruments

### Field Strength Meters for TV, FM and Satellite Reception

Now available from Emona! The Sadelta range of field strength meters for installation of both terrestrial and satellite TV reception systems.

Manufactured specifically for operation in the field, all units come with a custom-made protective, padded carry case and are battery operated. Most units also include demodulated audio output, with in-built loudspeaker.

The TC-402D, 80 & 90 include multi-turn potentiometer and a 4 digit LCD display for frequency selection and indication. The TC-500 offers high resolution frequency control and colour CRT display of all parameters.

### Field Strength Meter For Terrestrial TV & FM plus Spectrum Analyser

The TC-500 is a portable, battery operated 2-in-1 meter and analyser, with a high resolution colour LCD display and Centronics & RS-232 interfaces.

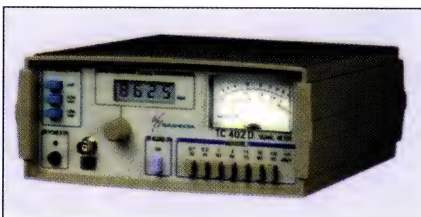
- 46MHz to 862MHz frequency range
- Full frequency range spectrum analyser
- Measurement range 20dBmV to 130dBmV
- Peak signal level detector
- Colour display of PAL TV/video signals
- Analyser span from 5MHz to full range



- Up to 3 hour battery operation
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- LNC current drain indicator
- Two frequency & amplitude markers on screen. Auto peaks/differences search.
- Competitively priced at **\$5,094** + tax

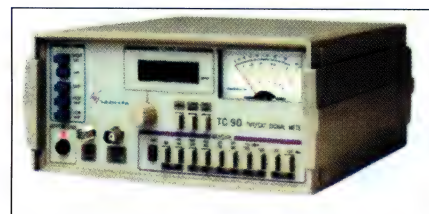
### For Terrestrial TV & FM

Due to its small size and light weight, the TC-402D is an ideal instrument for the installation of FM and Terrestrial antenna, as well as CATV systems.



- 45MHz to 862MHz frequency range
- Measurement range from 20µV/26dBµV to 100mV/100dBµV
- Peak signal level detector
- Analog scale with µV and dBµV
- AM and FM audio with loudspeaker
- Up to 8 hour battery operation
- Multi-turn tuning potentiometer
- 4 digit LCD display of frequency
- Affordably priced at just **\$678** + tax

### For Terrestrial TV & FM and Satellite TV



The TC-90 is Sadelta's all-in-one field strength meter.

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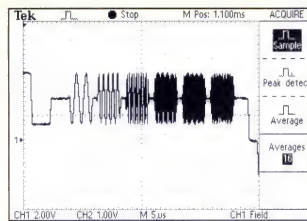
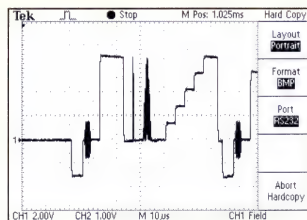
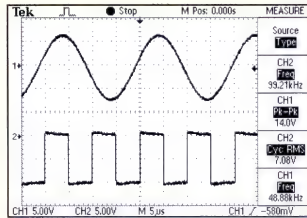
## A New Generation Oscilloscope

Tektronix' new TDS-200 Series are affordable, compact, general purpose digital storage oscilloscopes that work just like traditional analog scopes.

The technological breakthrough that these scopes represent is an extraordinarily high real-time digitising rate of **1 Giga Sample per second**, per channel, and prices starting at only \$1,395 ex-tax. This very high digitising rate, coupled with a very high screen update rate, make the TDS-200's display respond very much like a traditional analog scope.

The five screen dumps reproduced in this advertisement illustrate the breadth of applications to which the TDS-200's can be put: from general purpose waveform measurement, TV and video signal work, high speed pulse measurement and even lissajous figures!

Each of these five black & white screen displays was down loaded to PC using the TDS-200's optional serial/parallel/GP-IB interface, TDS2CM.



### DRT SCOPE PRIMER

Digital Real Time, **DRT**, is an advanced high speed oscilloscope digitising technology, exclusive to Tektronix.

**DRT** technology enables scopes to sample fast enough to reconstruct high-speed signal edges and transients, providing extraordinary waveform **clarity**, **update rate** and **stability**.

Characteristics of **DRT** oscilloscopes include:

- The sample rate is at least 5 times the scope's analog bandwidth: referred to as *oversampling*;
- Each channel *oversamples* at the same rate;
- The need for "equivalent time" sampling techniques is eliminated;
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**DRT** digital oscilloscope technology provides the closest digital oscilloscope display to that of the traditional analog oscilloscope. Moreover, **DRT** technology exposes signal details that might otherwise remain unseen.

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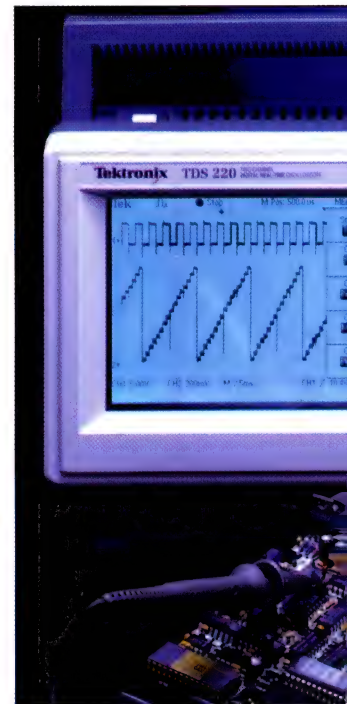
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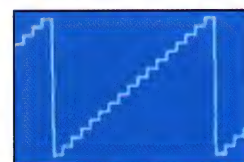


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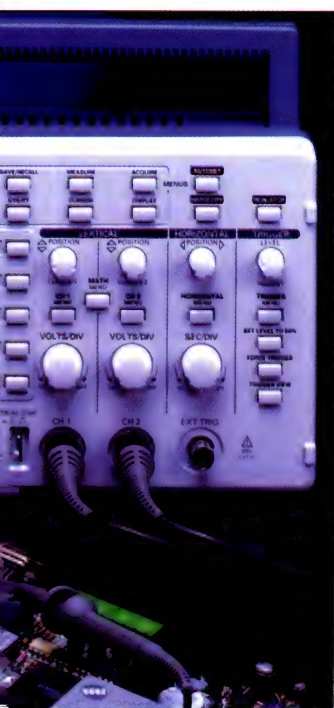
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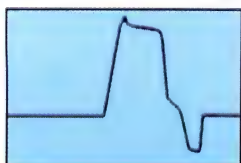
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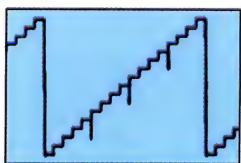
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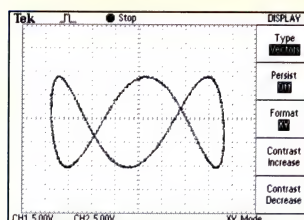
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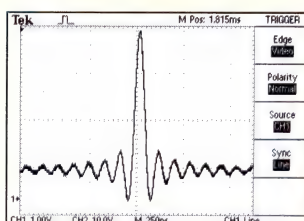
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The CESVA model SC-2 is a compact, digital, handheld Type II sound level meter with A weighting filter response.

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Functions include fast (125ms) and slow (1s) sound measurement, and a memory function that stores the last reading and the last maximum value of each measurement function.

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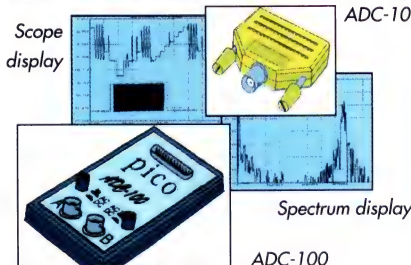
Key EMC measurement facilities include, Quasi Peak evaluation, Peak Emissions profile, selectable targeting of peaks and CISPR bandwidths of 9kHz & 120kHz.

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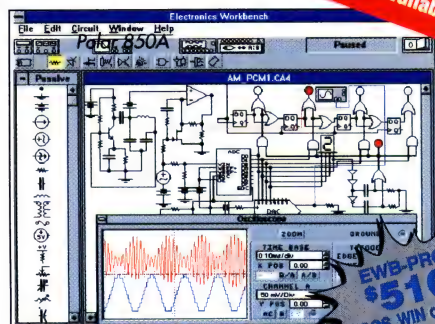
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# Transient voltage suppression

Preventing transients from damaging sensitive telecommunications equipment is an essential part of any system. *Athena Wang* takes a look at some of the most common devices used for this purpose.

**E**lectrical transients in the form of voltage surges have always existed in electrical distribution systems, and prior to the implementation of semiconductor devices, they were of minor concern. The vulnerability of semiconductors to lightning strikes was first studied by Bell Laboratories in 1961. A later report tried to quantify the amount of energy certain semiconductors could absorb before they suffered latent or catastrophic damage from electrostatic discharge. Despite these early warnings, industry did not begin to address the issue satisfactorily until the late 1970s.

The seven major sources of overvoltages are: lightning; sunspots; switching of loads in power circuits; electrostatic discharge; nuclear electromagnetic pulses; microwave radiation; and power cross.

Most electrical and electronic devices can be damaged by voltage transients. The difference between them is the amount of energy they can absorb before damage occurs. Because many modern semiconductor devices, such as small signal transistors and integrated circuits can be damaged by disturbances that exceed the voltage ratings at only 20volts or so, their survivability is poor in unprotected environments.

In many cases, as semiconductors have evolved their ruggedness has diminished. The trend to produce smaller and faster devices, and the advent of MOS-FET and gallium arsenide FET technologies has led to an increased vulnerability. High impedance inputs and small junction sizes limit the ability of these devices to absorb energy and to conduct large currents. It is necessary, therefore, to supplement vulnerable electronic com-

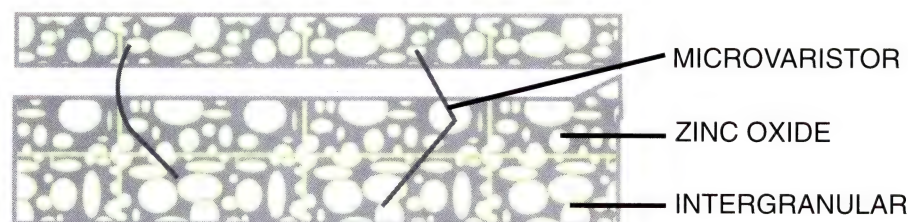


Figure 1. Metal Oxide Varistor (MOV) structure.

ponents with devices specially designed to cope with these hazards. Listed below are the four primary philosophies for protecting against transients.

- **Clamping**, or “clipping” is a method of limiting the amplitude of the transient.
- **Shunting** provides a harmless path for the transient, usually to ground by way of an avalanche or a crowbar mechanism.
- **Interrupting** opens the circuit for the duration of the transient.
- **Isolation** provides a transient barrier between hostile environments and vulnerable circuits through the use of transformers or opto-isolators.

Selection of the proper protective method should be made based upon the thorough investigation of the potential sources of the overvoltage hazard. Different applications and environments present different sources of overvoltages.

There are a number of transient voltage suppressor (TVS) devices available, with each finding a use in various applications based upon performance and cost. All types are essentially transparent to the line until a transient occurs, however, some devices have significant capacitance to load the line for ac signals. Com-

mon devices used for TVS applications include: air-gap carbon block; 2- and 3-element gas tubes; heat coil switch; metal oxide varistor (MOV); Zener regulator; unidirectional avalanche TVS device; bidirectional avalanche TVS devices; thyristor TVS devices; and dual thyristor TVS devices.

The most commonly used protection devices are MOVs, zener regulators, unidirectional and bidirectional avalanche TVS devices.

## MOV Advantages

- High current capability
- Broad voltage spectrum
- Broad current spectrum
- Fast response
- Short circuit failure mode

## MOV Disadvantages:

- Gradual decrease of breakdown voltage
- High capacitance



## Metal oxide varistors

The metal oxide varistor (MOV) is composed of zinc oxide granules in a matrix of bismuth and other metal oxides. The interface between the zinc oxide and the matrix material exhibits characteristics similar to that of a p-n junction having a voltage breakdown of about 2.6V. With this structure, the electrical equivalent is that of groups of diodes in parallel which are stacked in series with similar parallel groups to provide the desired electrical parameters. The taller the stack, the higher the breakdown and operating voltage. Larger cross-sections provide higher current capability. The structure of an MOV is shown in Figure 1.

MOVs, formed from a ceramic-like material, are usually produced in the shape of discs, with most widely used MOVs having diameters of 7mm, 14mm and 20mm. The disc surfaces are coated with a highly conductive metal such as silver to assure uniform conduction through the cross sectional area of the device. After terminal attachment, the parts are coated with a durable plastic material.

A typical voltage spectrum of MOVs ranges from 8V through 1000V for individual elements. Pulse current capability (8/20 $\mu$ s) ranges from a few amperes to several thousands amperes depending on the element's size. The V-I characteristic of MOVs is shown in Figure 2.

Key electrical specifications include operating voltage and breakdown voltage by a margin sufficient to produce negligible heating under normal operating conditions. Breakdown voltage is the transition point at which a small increase in voltage results in a significant increase in current producing a clamping action. Maximum limits for breakdown voltage are typically pulse rated with an 8/20 $\mu$ s waveform, since they are intended primarily for use across power lines.

The clamping characteristics of a 27Vac rated MOV with a 4 joule maximum pulse capability is shown in Figure 3.

The transient energy is derived from an exponential-

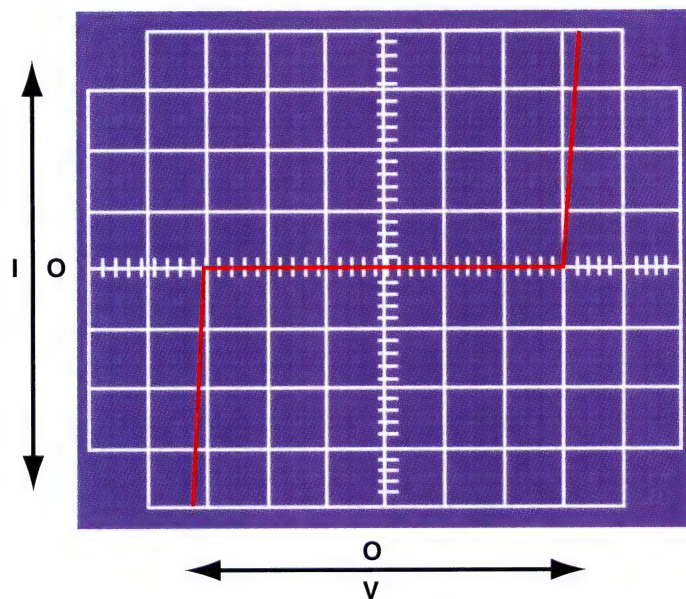


Figure 2. Typical V-I characteristic of a MOV

ly decreasing pulse having a peak amplitude of 90V. The pulse generator source impedance is 0.55W. Peak clamping voltage is 62.5V while the developed current is 50A. The clamping factor calculates to be 2.3. Leakage currents are listed for MOVs intended for use in sensitive protection applications but are not normally listed for devices most often used on power lines. Leakage current behaviour is similar to that of a p-n junction. It roughly doubles for every 10°C increase in temperature and also shows an exponential dependence upon applied voltage.

End-of-life for an MOV is defined as the voltage breakdown degrading beyond

the limits of  $\pm 10\%$ . As MOVs are pulsed, they degrade incrementally as granular interfaces are overheated and changed to a highly conductive state. Failure occurs in power line applications when the breakdown voltage has degraded to the point where the MOV attempts to clip the powerline peaks. In telecom applications, their breakdown must be above the peaks of the impressed ac line during a ring cycle or a power cross; otherwise an immediate catastrophic failure will occur.

When MOVs fail catastrophically, they initially fail short. However, if a source of high energy is present as might occur with a power cross, the follow-on current may cause the part to rupture resulting in an open circuit.

The capacitance of MOVs is fairly high because a large device is required in order to achieve a low clamping factor; consequently, they are seldom used across telecom lines.

## Zener TVS

Zener TVS devices are constructed with large area silicon p-n junctions designed to operate in avalanche and handle much higher currents than their cousins, Zener voltage regulator diodes. The planar construction cross section is shown in Figure 4.

Key electrical parameters include maximum operating voltage, maximum reverse breakdown voltage, peak pulse current, peak clamping voltage, peak pulse power and leakage current.

The normal operating or working voltage is usually called the reverse standoff voltage in specification sheets. Devices are generally available over the range of 5V through 250V. Standoff voltage defines the maximum peak ac or dc voltage which the device can handle. Standoff voltage is typically 10% to 15% below minimum reverse breakdown voltage.

The reverse breakdown voltage is specified at a bias level at which the device begins to conduct in the avalanche mode. Test current levels are typically 1mA for diodes which breakdown above 10V, and 10mA for lower-voltage devices. Softening of the breakdown knee

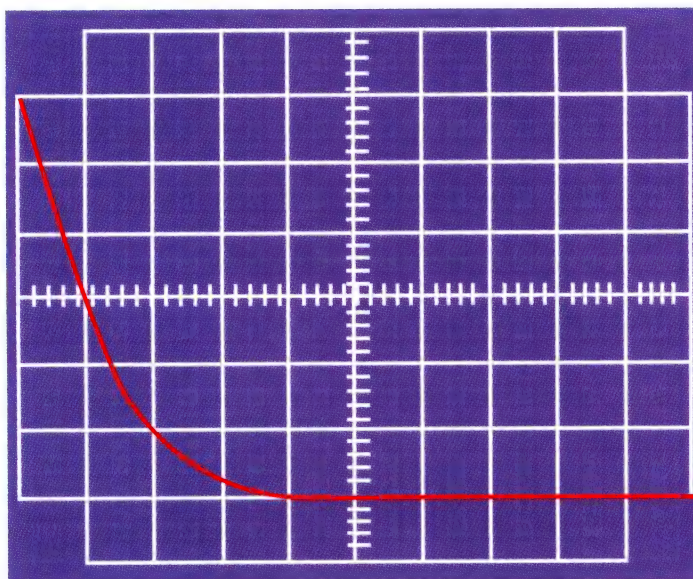


Figure 3. Clamping characteristics of a 27Vac-rated MOV with a 4 joule max. pulse capability.



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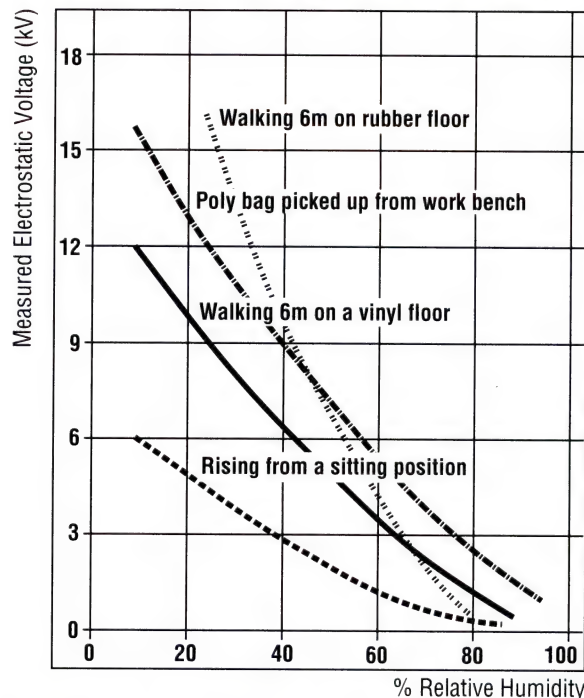
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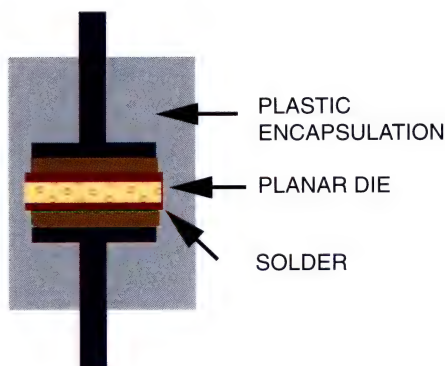


Figure 4. Planar construction cross section of a typical Zener TVS device.

for lower voltage p-n junction devices requires a higher test current for accurate measurements of reverse breakdown voltage. Diodes that break down above 10V display a very sharp knee.

Peak pulse current is the maximum upper limit at which the device is expected to survive. Silicon p-n junctions are rated for constant power using a particular transient waveform; consequently, current is a function of the peak clamp-

ing voltage.

Peak pulse power is the instantaneous power dissipated at the rated pulse condition. Common peak pulse power ratings are 500W, 600W & 1500W for 10/1000µs waveforms. As the pulse width decreases, the peak power capability increases in a logarithmic relationship.

Switching speed is a prime attribute of the Zener TVS. Avalanche action occurs in picoseconds, but performing tests to substantiate the theory is extremely difficult. For practical purposes, the device may be regarded as responding instantaneously. Voltage overshoots which may appear on protected lines are the result of poor layout and packaging or faulty measurement techniques.

No wearout mechanism exists for properly manufactured Zener diode chips. They are normally in one of two states; good or shorted out from over-stress. Long-term life studies show no evidence of degradation of any electrical parameters prior to failure. Failures result from stress which causes separation of the metal heat sink from the silicon chip with subsequent overheating and then failure. Like MOVs, silicon chips quickly fail short under steady state or long dura-

## Zener TVS Advantages:

- High repetitive pulse power ratings
- Low clamping factor
- Sub-nanosecond turn-on
- No wearout
- Broad voltage spectrum
- Short circuit failure mode


## Zener TVS Disadvantages:

- Low non-repetitive pulse current
- High capacitance for low voltage types

tion pulses which exceed their capabilities.

Because of their fast response and low clamping factor, silicon devices are used extensively for protecting microprocessor based equipment from voltage surges on dc power buses and I/O ports. □

Athena Wang is a Sydney-based product manager with Avnet VSI.



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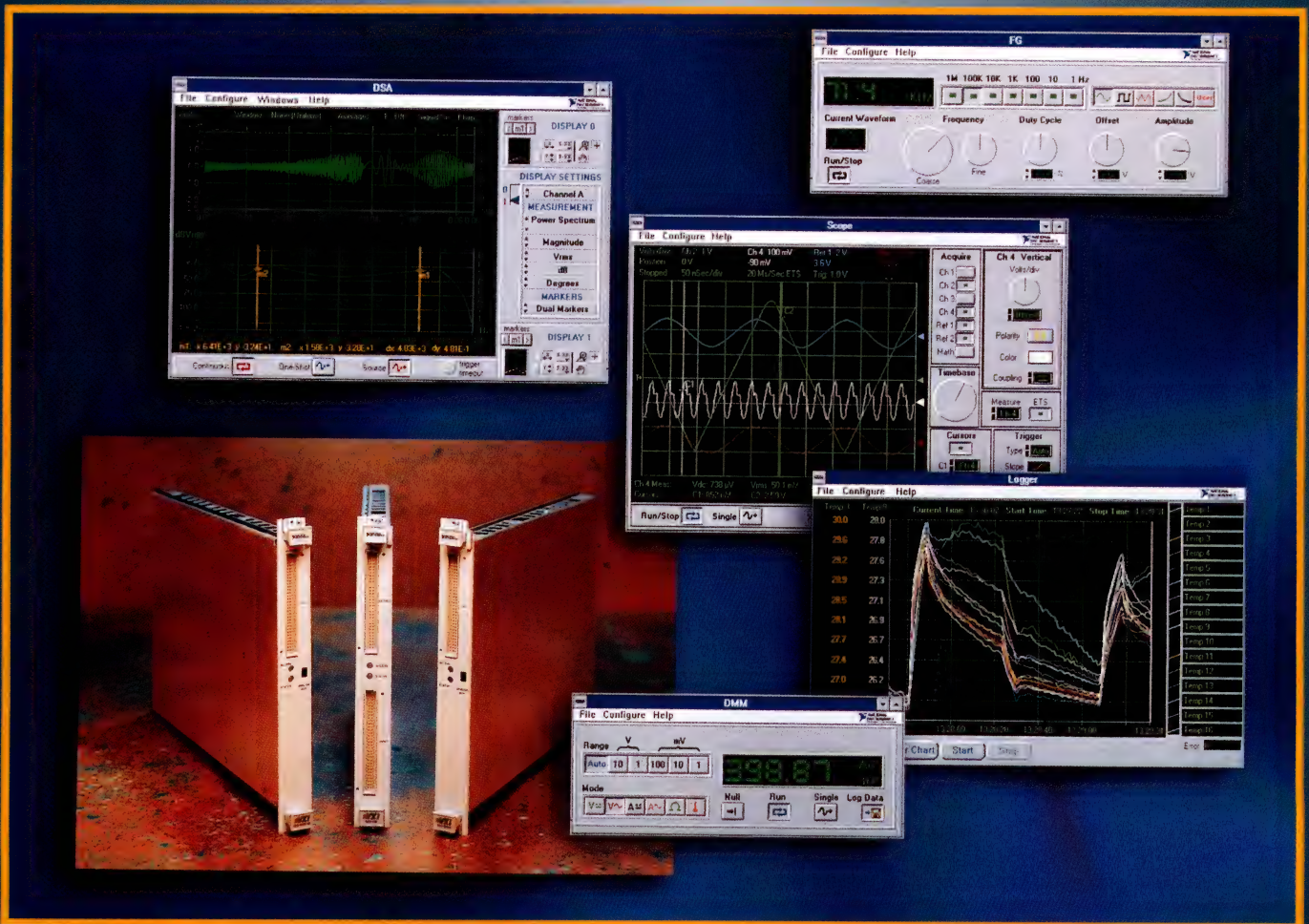
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# Low-frequency data collection

## *Pushing the acquisition envelope*

Data collection is one of the most common instrumentation tasks, with applications ranging from capturing fast pulses in a research lab to monitoring engine responses on a dynamometer. *Marvin Speer* explains how low-frequency collection systems often face the same challenging data-capacity demands as high-speed units.

While the digitiser of an acquisition system may capture at a very high sample rate (up to 5GS/s in today's fastest VXI instruments), it typically runs only one or two channels with 8-bit resolution. Also, it normally acquires for only a few milliseconds; for example, observing the output of a pulsed laser in a laboratory.

The digitiser's very high speed is balanced by its low channel count and brief acquisition time as well as its lesser resolution (compared to instruments having 12 to 16 bits). Because of this, the volume of data per unit time is manageable.

In contrast, a low-frequency data-collection system may have dozens of channels and 16 bits of resolution and monitor test points for many hours or even days. Its maximum sample rate may be only hundreds of kilohertz, but the cumulative effect of all those channels and bits can produce an aggregate data rate similar to that of the faster instrument. In other words, the amount of data that must be moved and stored per unit of time is massive.

Continuous data collection at any sample rate requires either a large buffer memory or direct storage onto a fast hard disk. Fast acquisition systems employ a buffer memory to contain incoming data as it accumulates.

But there is a threshold at which buffer memory requirements become impractically large. The buffer data must

be offloaded periodically to a mass storage device, interrupting data capture. A well-designed low-frequency data-collection system, however, can keep going almost indefinitely, thanks to the huge capacities available in today's disk arrays.

### **Data-collection system elements**

Applications for data-collection systems are broad and varied. They include routine tasks like fault prediction monitoring in a power plant as well as more "glamorous" jobs in wind tunnels and engine test cells.

A data-collection system consists of five major functional blocks: the digitiser, a signal conditioner (which controls signal levels and bandwidths going into the digitiser), a mass storage controller, a fast storage medium (a hard disk or disk array) and control software (see *Figure 1*). These functions may be partitioned in various ways and integrated to differing degrees, but every data-collection system shares the same basic blocks.

### **VXI as an acquisition platform**

Thanks to its instrumentation-quality measurement environment, modularity and open architecture, VXI has become the preferred data-collection tool set. VXI is built on concisely specified standards for shielding, cooling and power supply conditioning.

Among all the platforms available, only the VXI architecture provides the synchronisation features essential to many data acquisition tasks. A wealth of ancillary VXI hardware includes DMMs and switches often needed to carry out

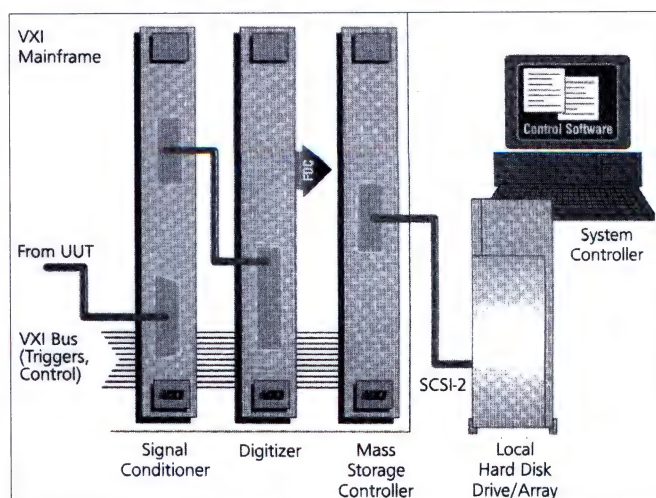


Figure 1. Typical elements of a data collection system.



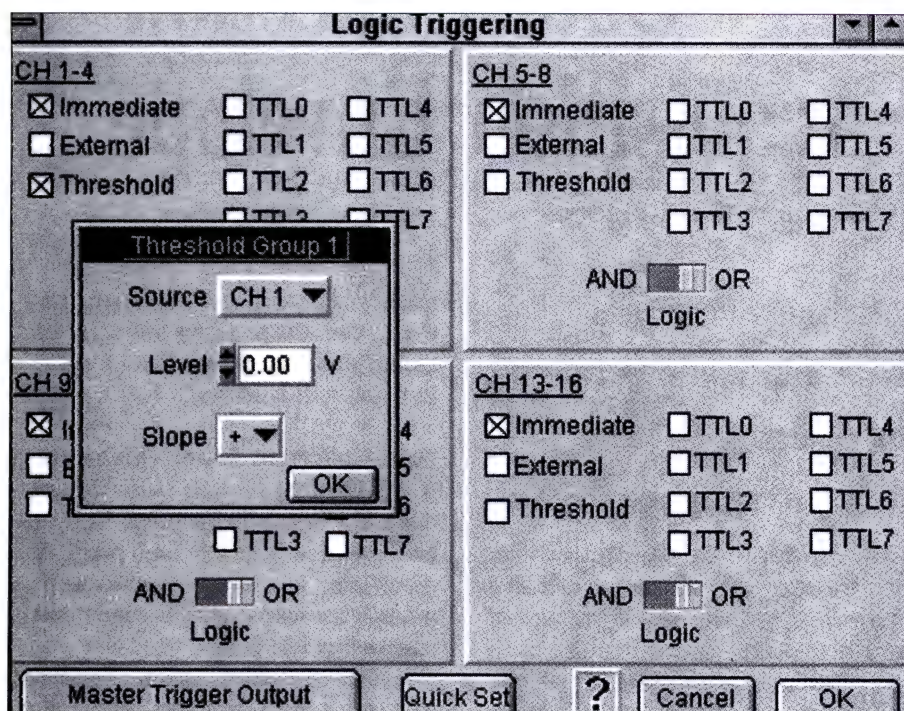


Figure 2. Good software allows easy setup of all test parameters.

measurements related to data collection.

The architecture is supported by a host of advanced software packages for program development and data analysis. VXIplug&play technology ensures the platform's ease of use and interoperability among diverse products.

Lastly, VXI can provide an efficient, optimised path to the data storage media. Using the fast data channel and a dedicated local hard disk, specially designed VXI mass-storage controllers can easily surpass the disk throughput of conventional PC storage architecture. After all, DOS disk transactions were designed for use with office word processors and book-keeping software.

A well-designed VXI data-collection system is greater than the sum of its parts. If the functional modules are designed to complement one another and are coordinated by a matching software package, then the interactions between the modules will proceed with the minimum overhead. Mismatches and redundant functions are eliminated, and with them excess cost and inefficiency.

## Intelligent data collection

Even among VXI components, individual module architectures can affect the system's ultimate data-handling capacity and effectiveness. Just as VXI mainframes, switches and other modules have benefited from on-board intelligence, data collection can be made "intelligent."

Instead of using post-collection data reduction to trim test results to man-

ageable proportions, the system can be programmed to acquire only certain narrowly defined events, even while a storm of other activity occurs on the monitoring point. The system only samples when it needs to, but retains the key information to reconstruct the entire history of the acquired event. The amount of information to be stored is reduced drastically.

Several characteristics distinguish the intelligent data-collection approach:

- conditional triggering;
- independent sample-rate allocation;
- and trigger-event time tagging;

Conditional triggering allows the digitiser to identify mutually exclusive or inclusive conditions before acquiring data. For example, you might set up an AND gating of a threshold (voltage) trigger, an external event trigger and a VXI TTL trigger to enable an acquisition. Even though millions of UUT cycles might go by, only those events that meet all three conditions would be recorded. The more trigger variables a digitiser allows, the less data it has to acquire and store.

Independent sample-rate allocation is a fancy name for tailoring the system's sample rates to use the minimum acceptable rate at each test point. If 16 test points must be observed, eight at 10kS/s and eight at 2kS/s, there is no need to run all channels at the 10kS/s rate required by the faster test points.

Some VXI digitisers can be partitioned into multiple banks, with each bank independently programmable for a sample rate. In this example, one bank would run at 10kS/s and the other at 2kS/s —

an 80% savings in accumulated data points on the slower banks.

Trigger time tagging associates a specific time (typically the elapsed time from the initial trigger) to each packet of acquired data. Every captured event is identified by its time tag. This allows you to home in on an event and discard unwanted information that occurred before or after that time.

To illustrate intelligent data collection, let's look at an automotive dynamometer test. Dyno testing is fundamental to the design of automotive fuel and ignition systems, cooling systems and drive trains.

The test is a microcosm of data-collection requirements. The system must acquire both high and low voltages, including temperature and pressure sensor outputs and both analogue and digital waveforms of differing speeds, not to mention the dc voltages in the electrical system.

In our example, let us assume that a certain throttle position is suspected to be related to an infrequent but drastic drop in manifold pressure. The engine temperature also seems to be a factor. It might be necessary to go through many thousands of cycles of acceleration/deceleration to gather enough data to evaluate the problem.

The first step in data collection creates a test scenario. Here we define test parameters and boundary conditions. In a well-integrated data-collection system, this facility is built into the control software.

The software guides the user through the necessary steps: setting the sample rate and channel partitions, programming the signal conditioning, setting the trigger conditions and allocating storage space for the acquired data (see Figure 2). Ideally, the test scenario should prevent you from setting up dangerous or meaningless conditions for the test. Successful test scenarios can be saved and reused.

In the case of our dynamometer test, the digitiser is partitioned into four independent banks, each monitoring a different point:

- Throttle position sensor (2ms sampling period).
- Manifold pressure sensor (1ms sampling period).
- Cooling system temperature sensor (10ms sampling period).
- Crankshaft speed sensor (500µs sampling period).

Remember that a wide range of voltages must be monitored. While the manifold pressure sensor might put out micro-volt-level signals, the crankshaft sensor could put out voltages approaching 100V, depending on engine speed. This underscores the need for stringent conditioning of the signal going to the digitiser.



## TEST & MEASUREMENT

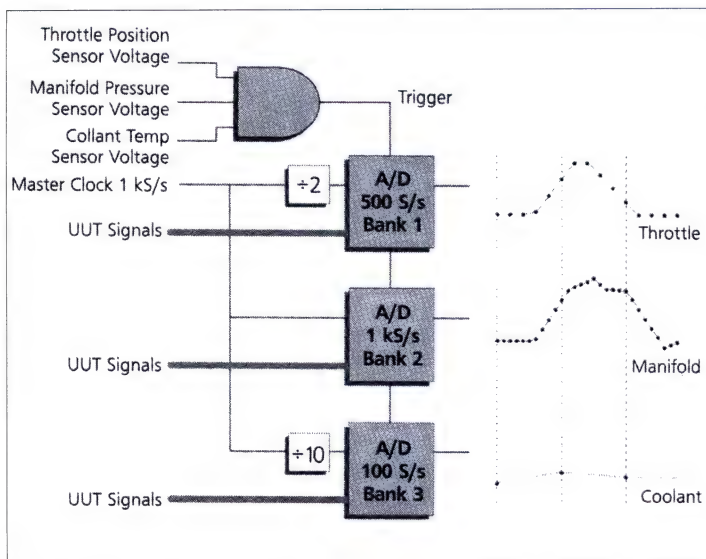


Figure 3. Trigger gating and data synchronisation for an engine dynamometer system.

While these modest sampling speeds wouldn't accumulate much data in the short term, remember that this dynamometer test could go on for weeks, or even months. By sampling at the lowest feasible rate on each test point, disk space

is conserved, maximising the length of time available to run the test. Again, intelligent data collection — in this case, conditional triggering — reduces the amount of data that must be captured.

Figure 3 shows the trigger gating setup and presents an overview of digitiser activ-

ity. Remember that the acquired waveforms are synchronised with one another, meaning any point on any waveform can be correlated with an equivalent point on the others. This is of great value in revealing cause-and-effect relationships.

After storing several weeks of uninterrupted data, potentially thousands of individual records, we can evaluate trends and recurring phenomena to distil a solution for the manifold pressure problem.

Summary

Low-frequency data collection looks deceptively simple. But when high channel count, high resolution and long sample times are accounted for, a data collection system's aggregate data rate approaches that of any high-speed acquisition system. Special measures must be taken to manage and minimise the data from long-term test and monitoring cycles. □

### Summary

Low-frequency data collection looks deceptively simple. But when high channel count, high resolution and long sample times are accounted for, a data collection system's aggregate data rate approaches that of any high-speed acquisition system. Special measures must be taken to manage and minimise the data from long-term test and monitoring cycles. □

This article was submitted by Tektronix and the author is with Tektronix in the US. This article first appeared in *Evaluation Engineering* magazine in March 1996.

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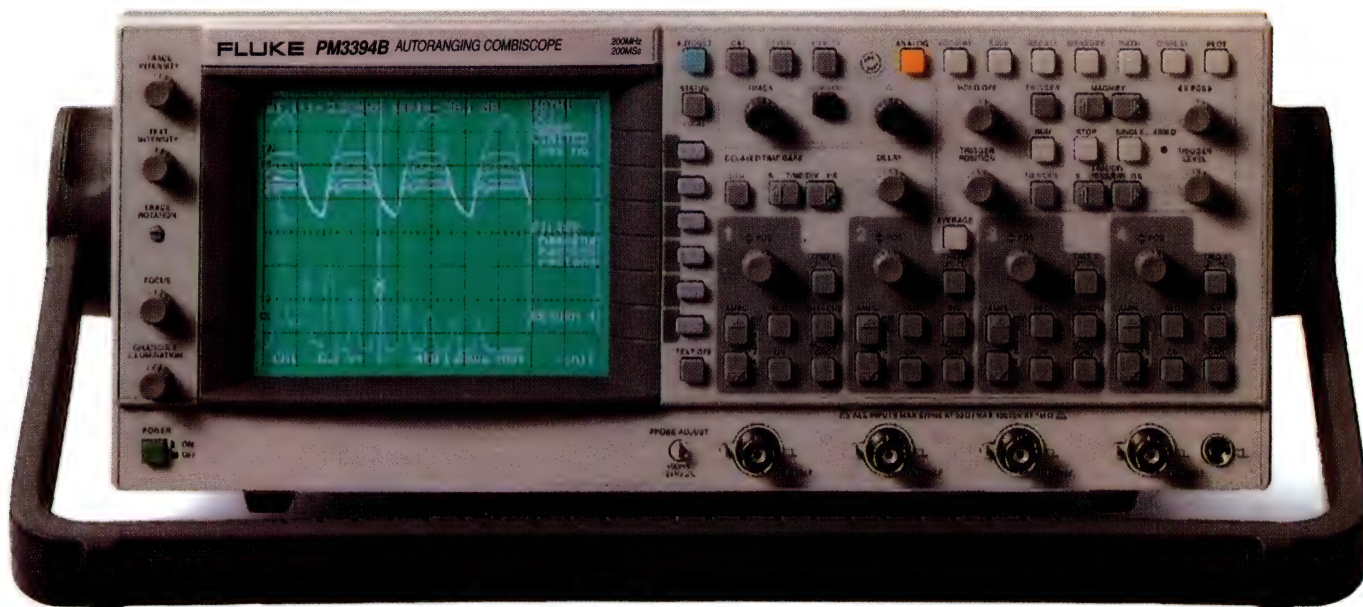
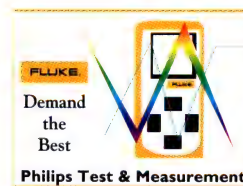
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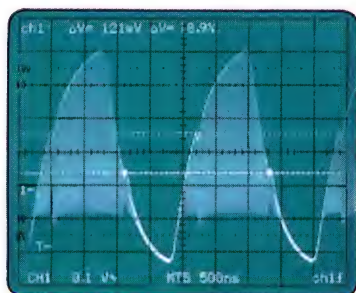


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# EMC precompliance testing

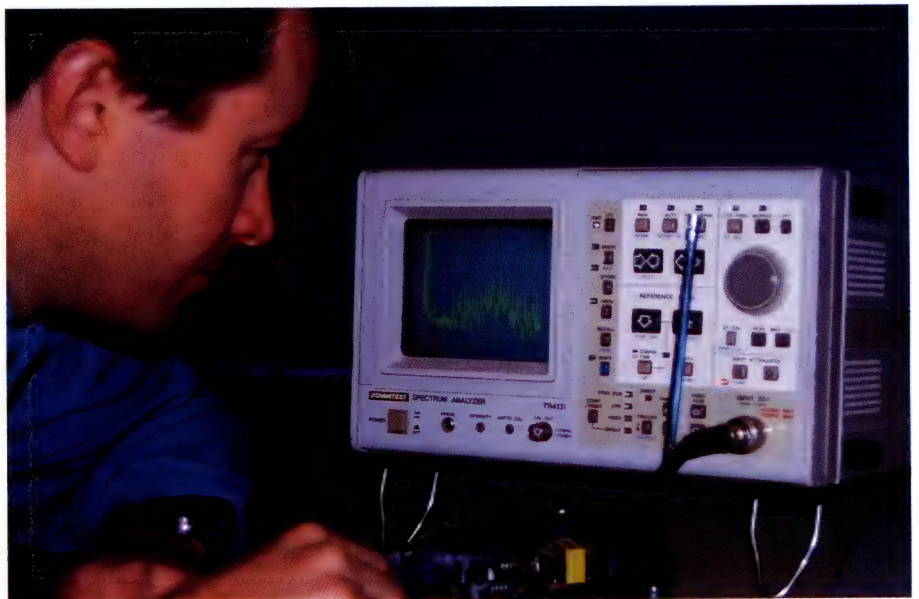
As from January 1 next year, all new electrical and electronic products will need to comply to EMC standards. *Martin Garwood* give some tips for getting your products smoothly through the test process.

Compliance to rules governing the amount of electromagnetic interference (EMI) a new product can produce will be mandatory from January 1 next year under the Australian electromagnetic compliance (EMC) framework. Unlike the early Austel approval system, which required a certificate from and Austel-approved test house before a product could be marketed, the EMC framework shifts the onus onto the manufacturers and vendors to ensure a product complies. There are several ways a company can document EMC compliance. An authorised test house can perform tests necessary to ensure your product complies with the standards and advise on ways to solve non-conformance issues.

In order to reduce testing delays and time to market for your product, two main steps should be taken before submitting your product to a testing authority for a formal compliance test. The first step is a good regime of precompliance testing or examination during the design and prototype stage, in order to minimise the chance of a failure during the formal compliance testing. The second step is to gather all information that a test house needs in order to complete the formal testing of a product. Paying attention to these two areas will help smooth your path through the new regulations.

## Precompliance testing and inspection

A good maxim for companies to follow when dealing with EMC issue during product development is "test early and test often". Find out at the design stage the standards that your product should



meet for market acceptance. Consult with your marketing department as to the countries in which the product will be sold. Test houses that are intimate with overseas requirements can advise on the Australian and international standards applicable, which can often be purchased through Standards Australia.

Research into applicable standards should not be restricted to just mandatory ones such as safety and EMC (Electromagnetic Compatibility). Include relevant industry standards such as those that exist for telecommunications performance, ergonomic use, environmental and hazardous materials, non mandatory EMC immunity standards etc. Compliance against non mandatory standards may result in a marketing edge over your competitor, and a more robust

and superior product.

Become familiar with the basic concepts of these standards, determine the class or limits that your product must be within for its intended use, and involve a consultant or test house that offers advice from the design stage of a product. It has been proven that most products fail electrical safety compliance due to inadequate isolation between differing voltage potentials within a product. Isolation requirements and standards interpretations also differ between countries. Designing your product for the most difficult markets in terms of safety and EMC will help to future proof you when exporting.

As an example, a mains powered facsimile machine must have reinforced isolation between mains (240Vrms) and sec-



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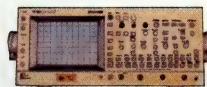
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## TEST & MEASUREMENT

ondary low voltage circuits. It also needs supplementary isolation between internal telephone connected circuitry (TNV) and low voltage circuits.

This isolation across barriers varies widely dependent upon circuit potentials and how they are used. Interpretation of distances and isolation levels also varies between various countries and their approvals bodies. Once again, consultation at the preliminary design stage of a product can save many hours of board and component rework, not to mention expense and delay. Redesigning printed circuit boards and finding compliant isolating components is easy at the design stage, expensive and frustrating after the product has been made and ready to sell.

Make sure all people responsible for prototyping of the product become aware of the required standards. Too often the person responsible for product compliance fails to inform people such as the printed circuit board draftsman of the isolation distances that need to be maintained between circuits. Sound EMC techniques should also be used when designing the PCB, such as maintaining shielding integrity, correct use of filters and separation of radiating circuits from inputs and outputs.

When performed correctly, EMC pre-compliance testing before submitting a product for final test gives confidence that the product will either pass first go, or require only minimal changes. Do pre-

compliance testing early and often.

To incorporate sound EMC techniques, the problem areas must be isolated (test early), and the design must not alter previously devised protection techniques (test often). Precompliance test equipment can be hired for a modest fee from rental companies and some test houses.

Comparison testing of a previously tested or compliant product is a good way to gain confidence of measurements. Try to obtain the actual unit that was tested, together with its report of test. Comparison testing can be performed two ways. One way is reproduce the test setup and try to get within 5dB of the previously measured values using antennas, groundplane and spectrum analyser. Keep in mind that the measurement uncertainty with precompliance test equipment may be 5 to 10dB greater than for the compliance test. The key is to be able to consistently reproduce results.

The second method is to refer to the test report and select several listed frequencies and note the associated level and how close the level is to the compliance limit. Try to select frequencies with a comfortable margin within the limit. Levels can be measured with a near field probe, antenna, or similar device in conjunction with an analyser or storage CRO with FFT. You now have a relative level for comparison against the new product.

Both sides of the EMC coin should be examined at the design and prototype stage, emissions and susceptibility. A

product compliant for mains harmonics, conducted emissions, radiated emissions, electrostatic discharge, radiated and conducted susceptibility, mains surges, dips and interruptions will not only pass requirements for most countries including EU member states, but will be more robust and reliable in field situations and hopefully less prone to failure. Alarm systems are clear examples where immunity to external fields would provide a reduced occurrence of false alarms and triggering.

When modifying a mains powered product or telephone interface to suppress emissions or increase immunity, take care to ensure the change has not altered electrical safety requirements. If unfamiliar with the applicable standards, use a consultant or test house that has intimate knowledge of both electrical safety and EMC standards.

### Information a test house needs

While adherence to good EMC design principles and frequent precompliance testing will help speed things up during product development, an understanding of the requirements of the test house when undertaking a full compliance test will minimise delays in getting test results.

The following are points to keep in mind when submitting a product for approval. Note that items submitted must be as near to production quality and type as possible to avoid retesting or unnecessary questions that may arise during an audit.

- You need to submit two production units or one unit plus spare power supply.

- When submitting a mains powered device for safety testing, tow working units or one plus a power supply should be given to counter product malfunction during testing (safety testing can be destructive). Flammability testing may be performed on plastic parts, printed circuit boards and switches within the device, so if a complete unit is expensive to replace, submit these parts separately.

- Give the test house all associated items such as cables and peripherals (for functional or EMC testing) together with an outline of the typical configuration.

- If the item is to be tested within another item, such as a card within a PC, finding an EMC-compliant PC will save test time and could even help reduce emissions from your product. Check if the test house uses EMC-quiet computers for emission testing, or provide your own, already configured. EMC compliant computers and peripherals are usually CE marked or hold a FCC Part 15 class B identification number.

## ON THIS MONTH'S FEATURE COVER

**National Instruments** has available a new line of low-cost, **VXI-based multifunction data acquisition (DAQ)** instrument modules.

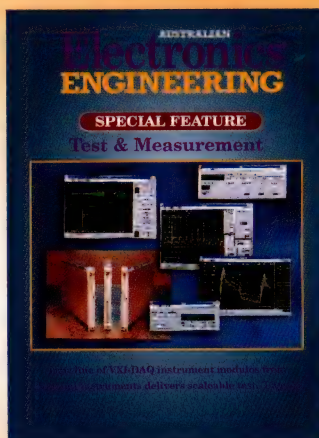
The **VXIplug&play**-compatible line includes: multifunction analogue, digital, and counter/timer modules; digital and analogue I/O modules; signal conditioning carrier module; amplifier/lowpass filter signal conditioning module; and a fixed excitation signal conditioning module.

The common architecture across modules enables users to build state-of-the-art instrumentation systems that are scalable between PC-based and VXI-based test systems.

All modules include NI-DAQ general-purpose driver software, which has the standard NI-DAQ API, so users who have developed applications using the company's DAQ products for PC/XT, AT, EISA, PCI, NuBus, or PCMCIA can immediately run applications on VXI-based modules with no software rewrite. All VXI-DAQ modules are compatible with LabVIEW and LabWindows/CVI. Because the NI-DAQ API is directly portable between PC and VXI platforms, the user has a scalable test architecture that spans functional boundaries within an organisation.

As well as contacting National Instruments directly, readers can access information by e-mail at [info.australia@natinst.com](mailto:info.australia@natinst.com) or through the National Instruments Instrumentation Web at <http://www.natinst.com/>. [1270](9180)

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## TEST & MEASUREMENT

• Most test houses encourage an engineer's attendance during testing for hard-to-configure items. Should a product fail testing, the engineer may then be able to make changes to aid compliance, thus reducing overall test time and charges. Most EMC labs provide a selection of after market components such as ferrites and mains filters for modifications "on the fly".

• Where the equipment has multiple ports of the same type, connecting a cable to just one of that type of port is sufficient, provided it can be shown that the additional cables would not significantly affect the results. Where a device may include multiple cards of the same type, such as a PBX, one card within the chassis is considered sufficient. One of each type of card must be tested to assume compliance, and each type must be operative during the test.

• Where a product may be powered by various power supplies, EMC testing must be performed on these variations, ie. +48dc and 240Vac or 110Vac, as power dissipation, current and voltage differences may have an effect on EMC performance.

• Several copies of legible circuit dia-

grams including power supply should be supplied. These are not only required by the relevant approvals body, but also aid the test house in defining isolation boundaries. They may also help in providing advice of overcoming non-compliances. If confidentiality is a concern, most test houses are happy to sign non-disclosure agreements and are bound by confidentiality requirements if NATA accredited.

• Give the test house copies of user/installation manuals. Take care that advice in the user manual does not conflict with installation requirements for safety and EMC compliance. If for example EMC compliance was achieved with shielded cables, such a comment should be reflected in the user manual.

• Block diagrams should be included if available. These often help a test house or approvals body understand complex or unusual pieces of equipment.

• Provide specifications of isolation components such as transformers, optocouplers, relays, etc. These specifications should reflect intended use of the component, ie. "tested to reinforced insulation to a working voltage of 240Vrms", or "approved to AS/NZS3108" for safety isolating transformers. Sourcing approved

components will reduce test time and cost.

• Give details including permit numbers of approved mains power cords, plugs, telephone line cords and power supplies to be sold with the item.

• Provide any software to be sold with the device (where applicable). Software configurations may affect compliance of your product.

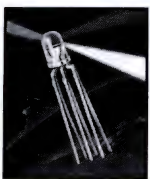
### To sum up

Determine your markets, the applicable standards and where your product falls within those standards. Educate all members of the design team regarding approval aspects, and perform precompliance testing and evaluation early and often. Test houses often give free advice if future testing is involved. Finally, submitting all associated information and support equipment with test samples will give you the best chance of getting your product to market ahead of your competitors. □

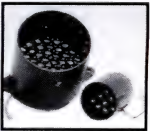
*Martin Garwood is the laboratory manager with Austest Laboratories.*

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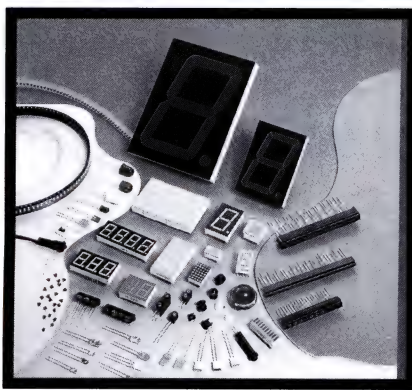
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# Vertical sampling

## *A new look at counting waveforms*

When using a frequency counter, seeing the waveform you're measuring can avoid false results, but usually means you need to connect a scope in parallel with the counter. *Charles Holtom* looks at a technique called vertical sampling which, when integrated into a frequency counter, gives a new way to show old waveforms.

**W**e all know that engineers and technicians use oscilloscopes to show what their signals look like. This is true even when the scope display is not the primary point of interest. For example, the scope could be used to monitor the output of a function generator or the signal input to a frequency counter. Most

people using frequency counters often use a scope too, almost as an insurance policy. They do not want to make false counts and they want to be certain that the reading they see on the counter relates to the signal fed into the counter.

A new voltage sampling technique developed by engineers at Fluke permits the integration of an accurate waveform display with the frequency counter itself, eliminating the need for a scope in applications where the scope display is used simply to give the user confidence in the measurements made on the counter.

In principle the technique is a very simple one. It is analogous to transitional timing in some logic analysers. This is when the analyser only records the time moment when the signal changes state from low to high or high to low, thus saving memory. The implementation in the waveform-displaying frequency counter is similar, only now, instead of two voltage levels (high/low) as in the logic analyser, the process depends on many accurately measured voltage levels.

High signal reproduction fidelity can be achieved compared to a traditional scope on repetitive signals with fast edges. And, when compared to a sim-

ilarly priced digital storage oscilloscope (DSO), the timing resolution is good because the process relies on the resolution of the counter/timer and not on a sample clock.

### Time versus voltage sampling

A digital storage oscilloscope operates by taking samples of the waveform at fixed time intervals that are governed by the sample clock speed. The voltage at the sample moment is then converted into a binary number and stored in the DSO's acquisition memory. From there it is transformed by a digital-to-analogue converter to the scope's screen. The controlling factor in the process is the sample rate. The sample rate is gov-

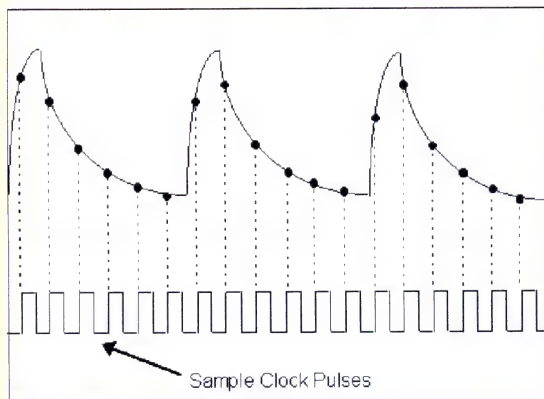


Figure 1. "Horizontal" sampling as used in a typical DSO.

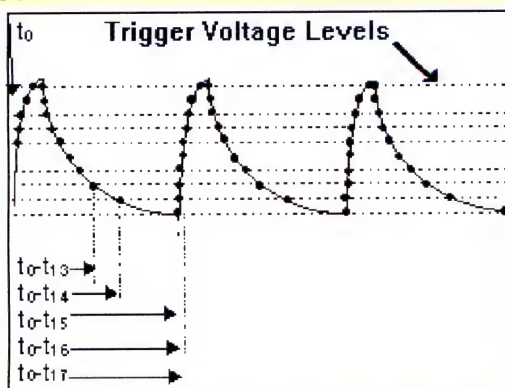


Figure 2. "Vertical" sampling relies on sample triggering at defined amplitude levels, rather than regular times.



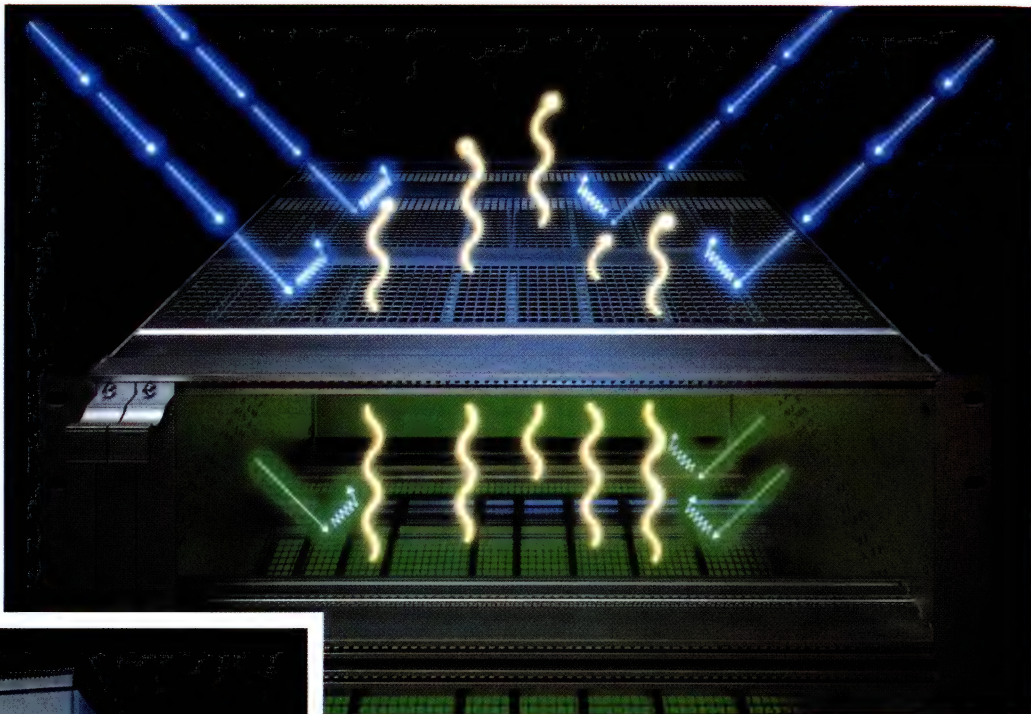
The Fluke 164 counter uses vertical sampling to implement an onboard waveform display, eliminating the need for a separate scope in many situations.



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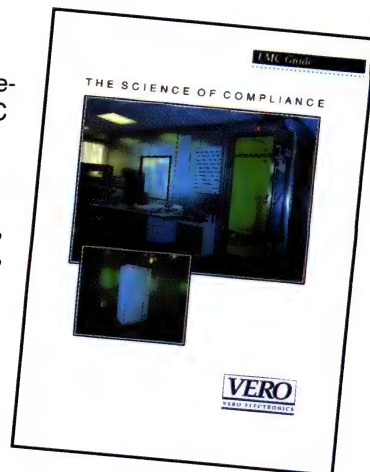
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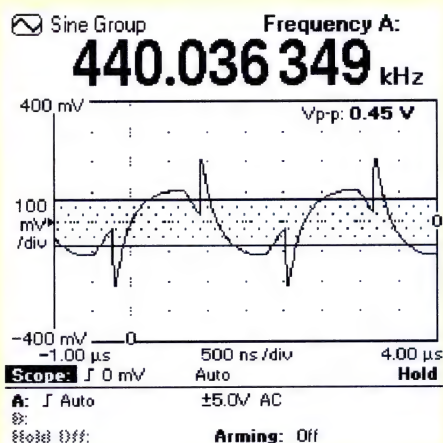


Figure 3. False counts could be caused by triggering on unexpected spikes.

erned by the setting of the DSO's timebase control which is a time function on the horizontal or "x" axis. So DSOs could be said to have "horizontal sampling".

If a signal has fast voltage transitions then the DSO takes only a few samples on the transitions because the time between samples is fixed for the timebase speed in use and is given by the reciprocal of the sample rate. When a DSO timebase runs at low speed then so does the digitiser and this limits the fastest transition that the DSO can display at that timebase speed. In Figure 1 the faster rising edge of the signal is sampled less than the slower falling edge in this typical charge/discharge curve. The sampling process controls the acquisition and the sample clock operating on the horizontal or x-axis controls the amount of signal detail acquired.

In vertical sampling shown in Figure 2, the trigger voltage of the counter/timer is increased in small discrete steps as

shown by the horizontal dotted lines. When the timer circuit is triggered at  $t_n$ , the elapsed time after  $t_0$  is used to locate the sample for waveform reconstruction. The timer function has a very high resolution, typically in the order of 1ns. This is not affected by a timebase speed as in a DSO, and this very high resolution is available all the time. As the samples are taken independently of a sample clock there is a tremendous wealth of information acquired when there are voltage changes in the signal. Compare the number of samples on the leading edge between Figures 1 and 2. Engineers making timing measurements would certainly choose Figure 2 for higher resolution results. In fact in Figure 1 there are 18 sample clock pulses and in Figure 2 there are only 10 trigger voltage levels used.

## Putting theory into practice

The technique of vertical sampling works best on signals that are stable in nature. It fits in well with frequency counters, which are used primarily on stable signals. If they were not, then the typical 8 to 10 digits of resolution would be meaningless and changing so fast as to be unreadable. It should not be forgotten that the purpose of seeing the waveform with a counter is to give the confidence normally obtained by using a scope in parallel with the counter and not to replace the scope for measurement purposes.

Figure 3 shows an example of the sort of signal that would produce uncertain results on a conventional frequency counter. The large spikes superimposed on the sine wave have their own distinct period. If a conventional counter's trigger level was incorrectly set it could easily count on a mixture of the signal's period and the interfering spikes.

Because we can see the waveform we already know that there is a chance of a counting error. The screen in Figure 3 is the screen from the waveform displaying counter. The frequency is given at the top as on a conventional counter. The triggering circuitry is used to deter-

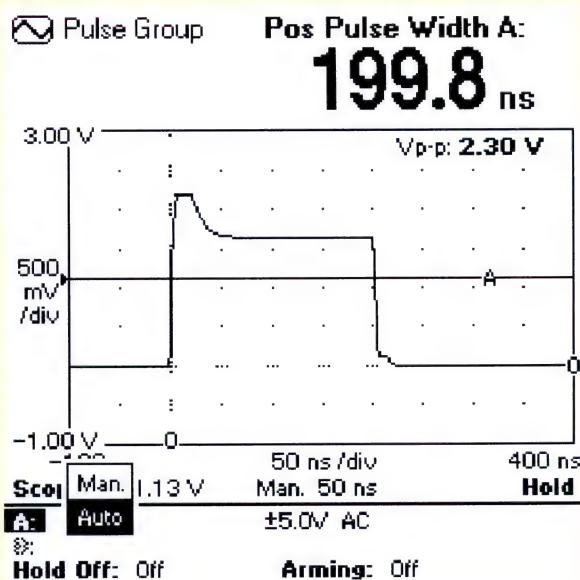


Figure 5. Correct trigger level for measurement of waveform pulse width.

mine the peak-to-peak voltage which is shown in the top right corner of the waveform display.

The dotted band through the center of the waveform shows the trigger hysteresis for the counter. This is set by the counter to remove the chance of false counts. To register a count the signal must rise fully through the band, fall through it and rise through it again. Looking at Figure 3, this means that the spikes now have no influence on the final reading because the hysteresis band is too wide for them to have any effect.

Figures 4 and 5 show an excellent example of why the waveform display assures the engineer that he is really getting a valid measurement result. The difference between the Figures is the trigger level. Without the waveform there is no clue as to which reading is correct. With the waveform display there is no possibility of error and it is obvious that the correct pulse width reading is given in Figure 5.

The vertical sampling technique, when implemented in a frequency counter, will give engineers and technicians more information about the signal that they are measuring, and will give them confidence in their measurement results. It will also make life easier on the bench and especially in the field, when it will no longer be necessary to find or carry a scope as an insurance policy when the frequency counter/timer results are the primary interest. □

The author is a product manager with Philips Test and Measurement, based in Sydney.

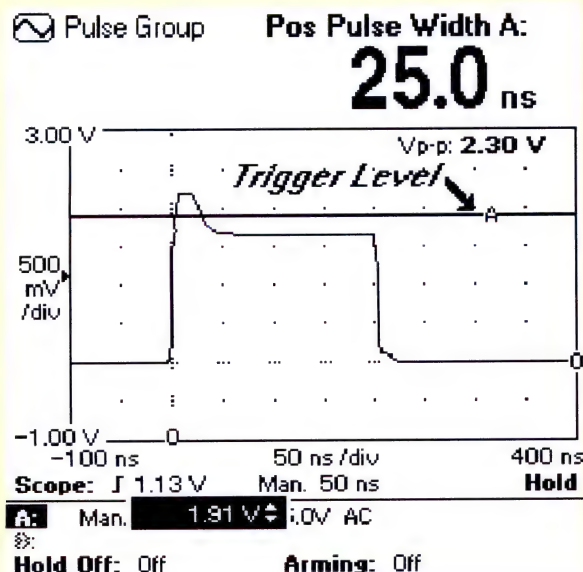


Figure 4. Trigger level set too high gives incorrect pulse-width measurement.



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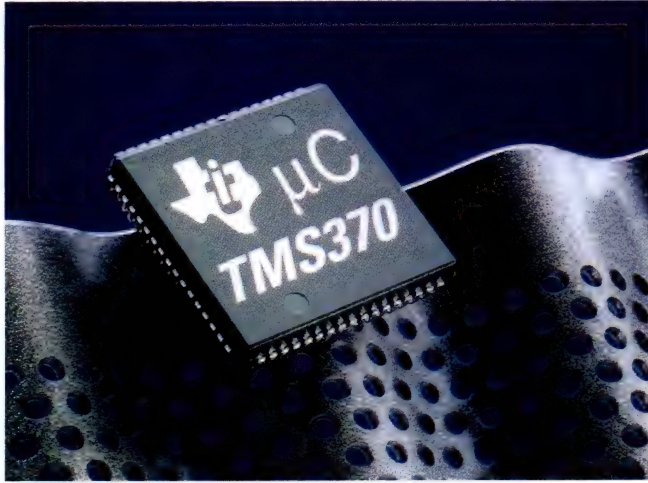
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## Specifications

| Model        | 2010         | 2002             | 2001             | 2000          |
|--------------|--------------|------------------|------------------|---------------|
| • Resolution | 7½ digits    | 8½ digits        | 7½ digits        | 6½ digits     |
| • DC volts   | 10nV – 1000V | 1nV – 1100V      | 10nV – 1100V     | 100nV – 1000V |
| • AC volts   | 100nV – 750V | 100nV – 1100V pk | 100nV – 1100V pk | 100nV – 750V  |
| • Ohms       | 1µΩ – 100MΩ  | 100nΩ – 1GΩ      | 1µΩ – 1GΩ        | 100µΩ – 120MΩ |
| • DC amps    | 10nA – 3A    | 10pA – 2.1A      | 10pA – 2.1A      | 10nA – 3A     |
| • AC amps    | 1µA – 3A     | 100pA – 2.1A     | 100pA – 2.1A     | 1µA – 3A      |



### 8-bit microcontroller family extended



ACD has announced that Texas Instruments has expanded its extensive TMS370 family by another 73 devices. The TMS370 family offers many highly-integrated ROM and OTP devices in a variety of package options. The CPU is based on a register file architecture supporting higher system throughput and reduction cost through efficient use of program memory.

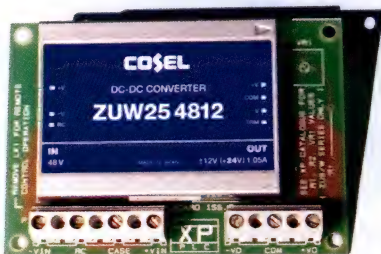
Memory options include ROM devices with up to 48kbytes of code memory with read protection for some devices; from 128bytes up to 3.5kbytes of RAM; from 0 to 512bytes of EEPROM; and between 8K and 48K

EPROM for OTP and Win-dow versions.

Product benefits of the family include high endurance on-chip EEPROM module with protection features; up to 15 ratiometric A/D converter channels for increased quality; system integrity — watchdog, privilege mode and clock fail circuitry; I/O robustness — clamping Schmitt trigger on all inputs; up to 3 x 16-bit timers/counters with PWM generation; ESD protection exceeding 2KV discharge on all inputs; and a PACT timer coprocessor on the 8-bit microcontroller. [390](0136)

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### PCB mounting board for dc-dc converters



Amtex Electronics has available a universal mounting board for its ZS and ZU range of dc-dc converters. Measuring 67 x 92mm, the board has separate input and output screw terminals. It can accept both the ZS series converters

(1.5, 3, 6 and 10W models) and the more powerful ZU series (10 and 25W). Space is provided for a trimpot to adjust the output voltage. A remote control link for the ZU series is also provided. [1740](2807)

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### Installation tools for breakstem fasteners

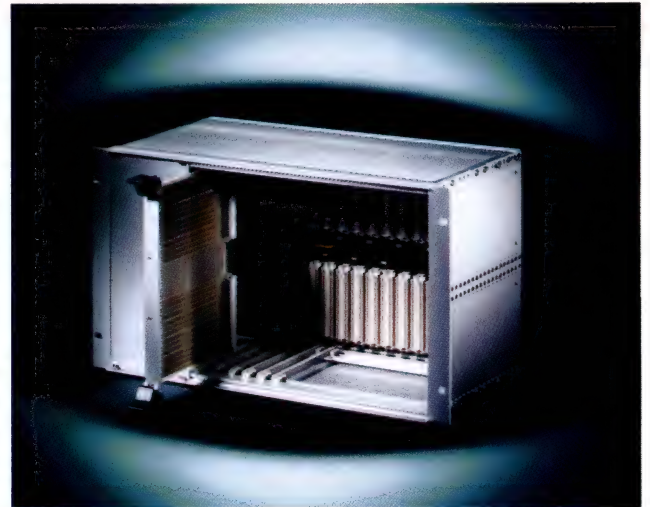
Avdel has launched a range of installation tools for placing the various combinations of Avdel breakstem fasteners. The G2 and G3 Genesis range was designed in response to customer specifications and application requirements, and sizes range from 3 to 10mm diameter.

The outer casing is made from glass-reinforced thermo plastic, which makes the tools lightweight and easy to handle in any orientation. Operator safety is enhanced by air shut-off devices and the tool is immobilised when the stem catcher bottle is removed.

For volume requirements the Genesis tooling can be suspended and is suitable for batch and flow-line assembly. The consistent modular design of the tools ensures that they are adaptable to changing component or production methods, reducing downtime and associated costs. Applications include electrical/electronic equipment, building and construction, automotive/ transportation, marine equipment, heating and ventilating, domestic appliances and medical components. [2520](0975)

**ENTER 3620 ON CARD**

### User-friendly 19in subrack plug-in units



Mayer Krieg has available two new accessories from Schroff for 19in subracks. The Schroff 19in plug-in units now feature a redesigned handle to allow easy insertion and extraction. This feature was made possible by lengthening the horizontal rail lip towards the front. The lip length is now 10mm with a track of square-punched holes, and serves as lever support for the handle when injecting or extracting plug-in units.

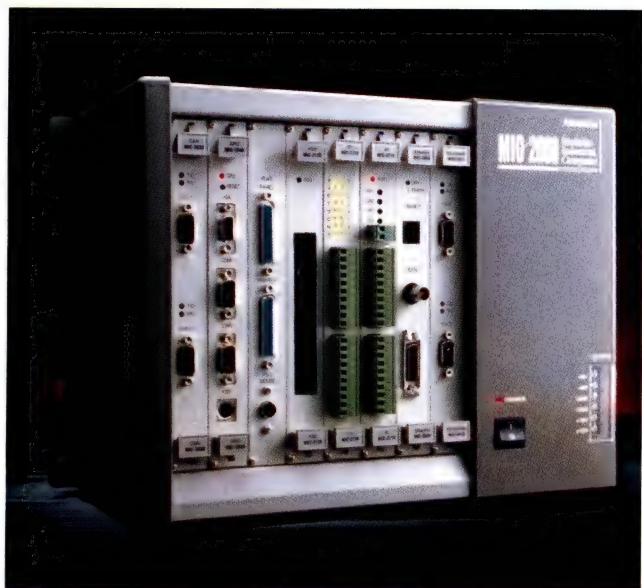
Where plug-in units can only be inserted in clearly defined slots inside the subrack, the Schroff handle facilitates keying by means of pins in the front handle and guide rail. Keying for one slot consists of three square

holes with flat integrated pins in the front panel handle and a counterpart on the guide rail. Inside the holes the pins may be installed in four different positions. When the pin positions in the handle and guide rail correspond, the plug-in unit can be injected. The coding remains accessible and can be changed even after the plug-in unit has been assembled.

A second product from Schroff may be used for conductive discharge. The ESD clip permits a "soft" discharge via a discharging resistor on the plug-in unit, so that a static load is not discharged via the connector. [1250](0088)

**ENTER 3621 ON CARD**



**PC-compatible industrial modular computer**

Priority Electronics is offering the MIC-2000 series of rugged and flexible PC-compatible industrial modules. Based on open ISAbus passive backplane technology, the modular system design makes upgrades and maintenance simple. Modules can be installed and removed using front panel access. Individual modules are available for floppy and hard disk drives, Flash memory, 486 processing units, networking, data acquisition/control and PCMCIA. The system also allows for specialised user half-sized ISA cards to be inserted for specific applications.

The series provides direct access to the I/O functions via front panel connectors and plug-in terminals. It is

available in 8 or 11-slot versions and can be panel or 19in rack-mounted. Made of heavy-duty steel, the units have an operating vibration specification of -5 to 17Hz, 0.1 double amplitude displacement, -17 to 500Hz, 1.5G acceleration peak to peak, and shock specification of 10G acceleration peak at 11ms duration.

The 250 watt power supply is configurable for 110 or 240Vac inputs, and includes safety and EMI approvals. The unit is suitable for a range of applications, including supervisory control and data acquisition, embedded machine control, motion control and robotics, and data communication systems. [387](6090)

**ENTER 3622 ON CARD**

**IR remote controller family extended**

GEC Electronics has announced that Zilog has extended its family of 8-bit microcontrollers with six infrared (IR) remote controllers, positioned for universal infrared interaction with entertainment products such as Internet appliances, home theatre, TVS, VCRs, audio systems and computers. The new devices will also support the upcoming wireless mouse and pointing devices that manipulate on-screen displays for Internet appliances and multime-

dia PCs.

The 8MHz IR remote members, the Z86L73, Z86L81, Z86L88, Z86L86, Z86L87 and Z86L89 are specifically designed for IR remote solutions that require high performance electronics in a small hand-held device. These highly-integrated devices combine power-on-reset, a watchdog timer, two-cell operation and low-voltage protection. [390](13121)

**ENTER 3623 ON CARD**

**8-pin OTP microcontrollers**

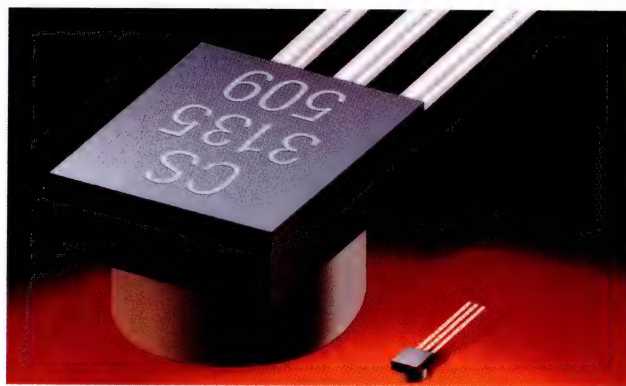
HarTec has available what it claims is the world's first 8-pin one-time-programmable microcontroller, from Chandler. The PIC12Cxxx family packs Microchip's powerful RISC-based PIC16/17 architecture into 8-pin PDIP and SOIC packages. These devices provide intelligence to applications where microcontroller performance was not previously possible due to cost and space constraints.

The PIC12C508 and PIC12C509 feature 512 words of program memory with 25 bytes of user RAM and 1024 words of program memory with 41bytes of user RAM, respectively. Both offer six I/O pins with on-chip oscillator, 33 single-word instructions, full speed 1µs instruction cycle at 4MHz, seven special function hardware registers, two-level deep hardware stack, 8-bit real time clock/counter with 8-bit programmable

prescaler, watchdog timer, direct LED drive, low 2.5-5.5 operating voltage and <2mA @ 5V, 4MHz low-power consumption. In-circuit serial programming of the OTP microcontroller offers a true self-contained intelligent system on a chip.

The family allows easy integration of first-time intelligent features into electro-mechanical designs and will compete directly with many 4-bit microcontroller products while providing significantly enhanced performance. Another seven devices are planned for release in the next year. Typical applications for the 508 and 509 devices include personal care appliances, remote transmitters, sensors and detectors, portable voice recorders, security systems, transponders, RF tags, rheostats and rechargeable battery modules. [390](7327)

**ENTER 3624 ON CARD**

**Magnetically-biased bipolar digital latch**

Adilam Electronics has available Cherry's type HE-3135 Hall-Effect latch assembly, developed for use with multipole ring magnets in applications requiring extreme sensitivity to magnetic field reversal. The assembly provides a rugged reliable interface between electro-mechanical equipment and bipolar or MOS logic circuits at switching frequencies of up to 25kHz.

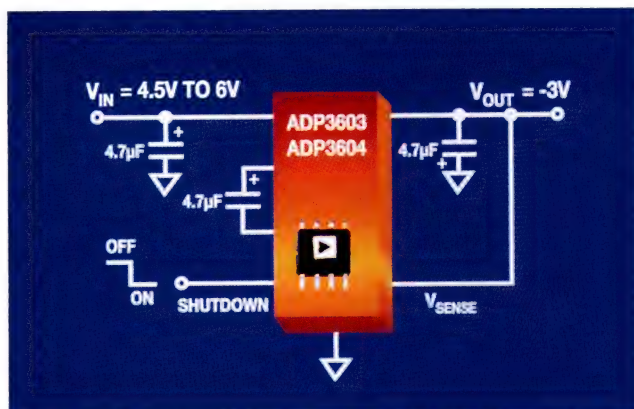
Because the operating state switches only with magnetic field reversal, and not merely with a change in

its strength, the integrated circuit qualifies as true Hall Effect latch. Each circuit consists of a voltage regulator, Hall voltage generator, signal amplifier, Schmitt trigger circuit, and an open-collector output driver on a single silicon chip. The on-board regulator permits operation over a wide range of supply voltages. The components of the monolithic circuit are carefully matched to provide accurate operation with wide variations in temperature. [1450](0025)

**ENTER 3625 ON CARD**



### Switched capacitor voltage inverters



HarTec has available Analog Devices' new ADP3603 and ADP3604 high-frequency, high-accuracy switched capacitor voltage inverters. The devices deliver a regulated output with high efficiency and low voltage loss, and eliminate the need for high-cost external inductors. They provide up to 50mA and 120mA respectively of output current, with  $\pm 3\%$  output error over their 120kHz output switching frequency. Output ripple is only 15mV and 25mV respectively, and their high switching frequency makes operation possible with capacitors as small as 1µF.

The regulators dissipate less than 400mW of power. Users can enable a fast shutdown mode in less than 5ms,

dropping quiescent current to 1.5mA, making the devices suitable for use in computer peripherals and add-on cards, portable and battery-powered instrumentation, pagers and radio-controlled receivers, disk drives, mobile phones and other communications devices.

The devices are designed primarily for use as high-frequency voltage inverters and negative voltage regulators. Output is fixed at -3V from input voltages ranging from +4.5V to +6V. Their load regulation is 0.12mV/mA and 0.32mV/mA respectively. Both are available in small-outline 8-pin SOICs with an operating temperature of -40 to +85 °C. [1740](7327)

**ENTER 3626 ON CARD**

### Design tool for 3 and 5V CPLDs

Philips Semiconductors has announced the availability of the XPLA Designer, a low-cost stand-alone design tool to support Philips' new CoolRunner 3V and 5V CPLD devices. Philips' recent entry into the CPLD arena is supported by accessible state-of-the-art design solutions, based on a complete software strategy that combines third party support with the availability of XPLA Designer. Third party agreements with vendors such as Synario Design Automation, MINC and ISDATA deliver easy access to Philips' CPLD technology, using world-class CAE tools within Mentor Graphics, Cadence, Viewlogic and Synopsys environments.

XPLA Designer is a PC

Windows (3.1X and 95)-based tool that offers design entry, editing, synthesis, device fitting, functional simulation, and full-timing simulation. Support is included for popular state machine constructs, truth tables, and Boolean equations.

The Philips 100K gate ASIC simulation engine is accessed via both a graphic waveform editor/viewer, and a full simulation control language. These alternatives allow users to rapidly simulate designs via interactive waveform entry and analysis, as well as developing extensive scripts for very complex vector patterns. [384](4180)

**ENTER 3627 ON CARD**

KD Fisher has available ELM Technologies' **ELM611AA 10 channel current driver LSI** containing analogue sample and hold circuits. This CMOS driver IC which can express half-tone, was developed to control LEDs. It is suitable for LED drivers and is applicable to equipment which controls current-driven devices. [841](914)

**ENTER 3628 ON CARD**

Kenelec has available Burr-Brown's **ADS800 family of monolithic A/D converters** which offers 10 and 12-bit resolution and 10-40MHz sampling rates. The converters come complete with quantiser, wideband track/hold, internal reference, and three state outputs, and are suitable for use in telecomms, test instrumentation, medical imaging, CCD imaging and video-digitising applications. [388](4)

**ENTER 3629 ON CARD**

John Morris Scientific has available Kistler **capacitive accelerometers** for surface mounting on PCBs. The micro-machined silicon measuring element is built into an hermetically sealed 24-pin flat pack and weighs 1.5g. These K-Beam elements are suitable for OEM applications such as direct integration into systems for monitoring vibrations and oscillations, for controlling motions, as well as vehicle and robot systems. [795](2039)

**ENTER 3630 ON CARD**

Geolab Systems has available the **Macro 5 SLR instant close-up camera**. It is a fully-automatic camera designed exclusively for close-up photography in a wide variety of professional and engineering disciplines. It produces self-developing instant colour prints at the push of a button and includes five precision close-up lenses, microprocessor control for accurate exposure, two electronic strobes for even subject illumination, and an internal power supply. [206](1344)

**ENTER 3631 ON CARD**

Electronic Development Sales has available Fujitsu Compound Semiconductor's two new **InGaAs Pin/Preamplifier modules**. These latest fibre optic comms devices are suitable for use in 1300nm wavelength range digital optical transmission systems. The FRM3Z121KT/LT and FRM3Z621KT/LT modules are for 156Mbits and 622Mbits short/long reach applications respectively. Both feature high sensitivity and GaAs IC transimpedance amplifiers with AGC. [811](4170)

**ENTER 3632 ON CARD**

DGE Systems has available the redesigned **G2R series Omron PCB power relay**, offering high current switching in a small package size. The standard models have flux protection, pre-tinned straight PCB terminals, single contacts and UL/CSA approvals. Ordering options include double-winding latching coil, high capacity (16A) bifurcated or twin crossbar contacts, plastic sealing, high sensitivity, operation indicator and single or double pole. [1740](2182)

**ENTER 3633 ON CARD**

Amtex Electronics has available what they claim is the industry's first **full-colour active-matrix electroluminescent (AMEL) high-resolution flat-panel headmount display**. The display is designed to be mounted in lightweight headgear and used with either a portable or belt-worn computer, allowing the wearer to view the screen at close eye-level proximity and with privacy. Lightweight and power-efficient, AMEL headmount displays provide virtual reality for commercial applications and consumer entertainment. [1590](2807)

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## Portable, multifunction DAQ box



National Instruments has announced a high-resolution, multifunction portable data acquisition box that communicates through the parallel port with PC/XT/AT and compatible computers. The DAQPad MIO-16XE-50 is built on the company's enhanced E series architecture for PC-based data acquisition and features the company's custom DAQ-STC system timing controller ASIC for counting and timing-related functions. The DAQPad features a built-in terminal block with screw terminals for convenient compact signal connection. Also included is an ac adaptor to power the device from any 120 or 230Vac source. Users can also power the device from an optional BP-1 rechargeable battery pack or any 9-42 Vdc source.

The device features a 16-bit ADC with a 20kS/s sampling rate, 16 single-ended or eight differential inputs and enhanced timing and

triggering capabilities. It has programmable gain up to 100, two 12-bit DACs with voltage outputs, one constant current source for powering resistance temperature detectors, 8 lines of transistor-transistor logic-compatible digital I/O, and two 24-bit up/down counter timers for timing I/O. It is compatible with the Enhanced Parallel Port (EPP) standard defined by IEEE 1284.

The device includes the DAQPad TB-52, a detachable terminal block with screw terminals for convenient, compact signal connection. The TB-52 is built in so no additional cables or accessories are needed. NI-DAQ Version 4.8 driver software for DOS and Windows is included, and the device integrates seamlessly with the company's LabVIEW and LabWindows/CVI application software. [388](9180)

**ENTER 3635 ON CARD**

## Miniature power relays receive UL approvals

Elektron has announced that American Zettler's 2100 series miniature power relays, with both PC and "Trace Saver" quick-connect terminals, recently received new TV-3 and TV-5 Tungsten rating approvals.

The relays feature an open-frame construction allowing them to run cooler. They are available in Form A, B and C contacts with a switching capability of up to 30amps. Class

B insulation (130 °C) is standard but models may be ordered with Class F insulation (155°C) for higher temperature applications. The series offers coil voltages up to 120Vdc and a minimum life expectancy of 100,000 operations at rated load. Applications include home appliances, automotive, air conditioners, control and heating equipment. [1740](19988)

**ENTER 3636 ON CARD**

Boston Technology has available a state-of-the-art **IBM PC AT compatible ISAbus card** capable of performing 8-bit A/D conversion at real time sampling rates of up to 250MSPS (million samples per second) in single channel mode and 125MSPS in dual channel mode, and Equivalent Time Sampling rates of up to 2GSPS with a bandwidth of 125MHz. [388](8233)

**ENTER 3637 ON CARD**

Automation and Process Control has available Strawberry Tree's **PCMCIA cards for IBM-compatible notebook PCs**. The cards are intended to augment the DATAshuttle family for parallel port data acquisition. Now customers can choose between a parallel port data acquisition solution or one using PCMCIA accessory slots. The new ST-PCM family of PCMCIA Type II cards consists of 12 and 16-bit analogue input modules with terminal panels for 16 single-ended or 8 differential inputs and a 12-bit, two channel analogue output model. [388](6484)

**ENTER 3638 ON CARD**

Automatic Time Control has available a family of instrument housings suitable for enclosing a wide range of electronics products. Manufactured by Fiber of Italy, the housings are made from flame-resistant fibreglass and are moulded with internal slides for the correct location and fixing of PCBs up to 1.6mm thick. Applications include housing industrial electronic controllers, timing devices, relay controls, process signal transmitters and sensors, etc. [1250](20579)

**ENTER 3639 ON CARD**

Boston Technology has available the **6012/PCI two-board system** comprising the CSx012 analogue board and the 6012PCI board. The former is an ISAbus card and the latter is a PCIbus card, the two boards communicating through a mezzanine bus. All signal conditioning and A/D conversion takes place on the CSx012 board and all data storage and PCI bus interface takes place on the 6012PCI board. The Compuscope 6012/PCI can sample analogue signals at speed of up to 60MSPS with 12-bit resolution. [388](8233)

**ENTER 3640 ON CARD**

Reptechnic has available Actel's **1200XL family of FPGAs**. This family builds on the ACT2 architecture to offer increased gate-array speeds of up to 40%, improved pin-to-pin speeds of up to 80% and double clock to out speeds. The family operates at a pipelined data rate of up to 175MHz with clock to out speeds of 9ns and pin-to-pin speeds of 12ns. Up to 8000 gate capacity is offered, featuring up to 16 x 32 macrocell CPLDs, 200 TTL devices and 140 user I/Os. [841](5722)

**ENTER 3641 ON CARD**

Reptechnic also has available Actel's **Integrator family of high-capacity FPGAs**, which in a single device combine the features of FPGAs with CPLDs and dual-ported SRAM. The first in the series is the 3200DX family which offers up to 40,000 gates and 3.5Kbits of dual port SRAM. Supported by a range of design automation tools, the family offers the system logic integration functions and performance needed to create high speed complex designs for microprocessor based systems, networking, and DSP applications. [841](5722)

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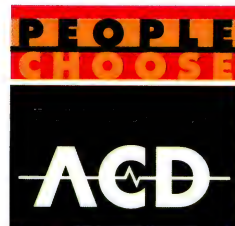
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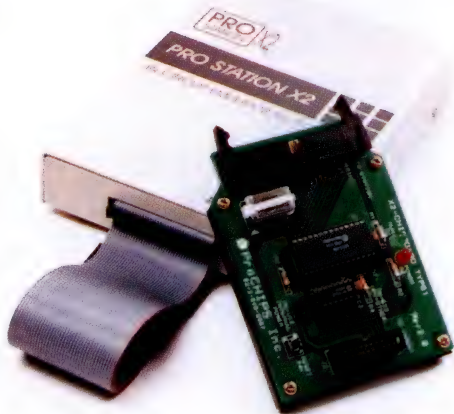


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### In-circuit emulators for microcontroller applications



Alfa-Tek has available Prostation-X2 and Prostation-5X real-time in-circuit emulators from Prochips for microchip microcontroller PIC16CXX applications. The devices feature easy-to-use GUIs which operate under both Windows 3.1 and 95.

The programmer can step through code, set breakpoints and modify registers from each window. Multiple windows are available on a single screen for examining source lists, special registers, and variable reg-

isters, and there is a watch window for viewing register sets. Both devices provide access to unlimited hardware breakpoints. With the X2 device, code can be executed at speeds from dc to 10MHz. The 5X offers real-time emulation up to 20MHz. The X2 supports all PIC16CXX families and will operate in conjunction with Prochipboard. The 5X supports all PIC16C5X families. [690](696)

**ENTER 3643 ON CARD**

### 2A step-down dc-dc controllers

Veltek has announced from Maxim Integrated Products the MAX1626 and MAX1627 step-down dc-dc controllers. These 8-pin devices provide the longest battery life available by combining three battery-saving features in a single device: high efficiency, low supply current and 100% maximum duty-cycle switching. Both devices deliver output currents to 2A, with efficiencies greater than 90% for loads of 2mA to 2A. Their 90µA maximum quiescent supply current (over temperature) reduces to just 1µA during a logic-controlled shutdown. Each controller drives an external P-channel MOSFET with duty cycle as high as 100%. Turning the switch fully on minimises the dropout voltage so the battery can more fully discharge before reaching the end of its useful life.

Current limited PFM control achieves high efficiency over a wide range of output current. Switching frequencies as high as 300kHz reduce the size and cost of the capacitor and inductor (22µH typical). The input voltage range is 3V to 16.5V, and each IC includes an internal soft-start capability that reduces surge currents during start-up. The 1626 offers pin-selectable preset outputs of 3.3V or 5V and the 1627 output is adjustable from 1.5V to Vin using just two external resistors.

Applications for the devices include portable/battery-powered instruments and communicators for which small size and long battery life are critical. Both devices come in 8-pin SO packages screened for the extended industrial temperature range. [841](3946)

**ENTER 3644 ON CARD**

### Serial interface module for single loop controller

Siemens has introduced a Profibus DP interface module for the single loop Sipart DR controller. The 6DR2803-8P Profibus interface can be used in all compact Sipart DR controller systems. It allows the controllers to communication as slaves with higher level systems, for example the Simatic S5 via Profibus DP. In this way the controllers form an open bus system according to the Profibus DP standard DIN 19245 part 3.

Coupling software (Sipart S5 DP) is also available for

interfacing the Simatic S5, 115U, 135U and 155U controllers via Profibus DP. The corresponding software for the new Simatic PLCs S7-300 and S7-400 called Sipart S7 DP is now available.

The function blocks for the Sipart DR19, DR20, DR22 and DR24 controllers included in the programs image the controller data to Simatic data blocks. This reduces the engineering effort needed for configuration and commissioning. [394](1562)

**ENTER 3645 ON CARD**

### Microcontroller starter kit



ACD is offering Texas Instruments' TMS370 microcontroller starter kit, a low-cost programming tool for developing applications using most of the TMS370 microcontroller range. The package is in three parts. The first, Assembly Language Cross Support, consists of a suite of utilities to aid production of a single COF format object file suitable for your target drive, including an assembler, archiver, linker, absolute lister, cross-reference lister and hex conversion utility.

The second part of the package is the PC simulator/debugger, which provides a PC-based platform to load and execute software without target hardware. The third part is the device programmer, a small circuit board connecting directly to a standard PC 9-way seri-

al communications port, which enables both the EPROM/OTPROM and EEPROM to be programmed on TMS370 devices.

Memory maps can be defined/installed to ensure that the code subsequently loaded is suitable for the target device. Areas of memory and reverse assembled code can be displayed and modified. Disks containing OS/2, DOS and Windows versions of the programming utility and supporting files are provided, together with an EPROM/EEPROM programming tool user's guide. The starter kit provides everything to generate and assemble TMS370 assembly language programs, simulate and debug, and program devices for further testing in your target hardware. [384](136)

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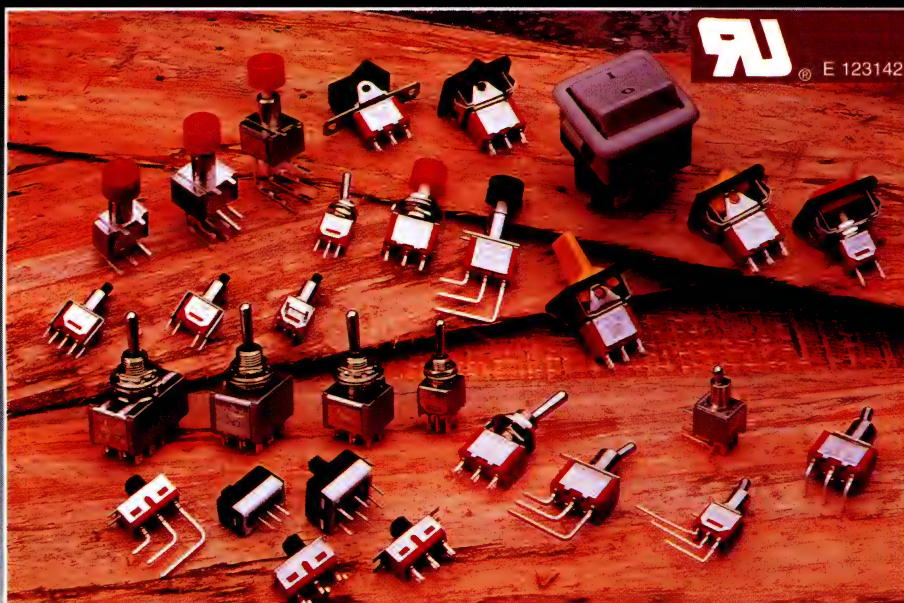
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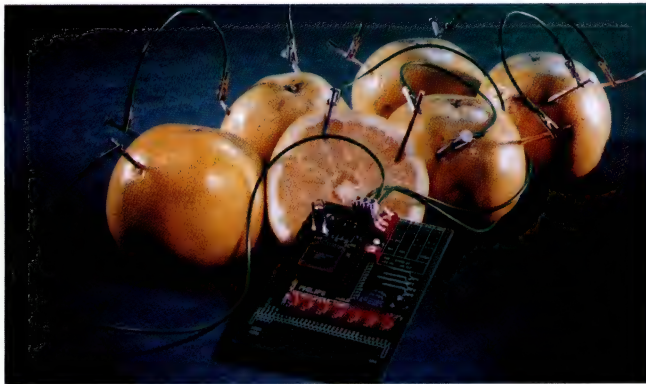
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**Fast 3V CPLD**

Philips Semiconductors has available what it claims is the world's fastest 3V CPLD, the first product in a new ultra-fast 3V CoolRunner family of products. The 3V PZ3032 with an 8ns delay from any input to any output, is 25% faster than the nearest competitor's device, according to Philips' CPLD business unit. The company has also introduced the 5V PZ5032, that features a 6ns delay, making it one of

the fastest 5V devices available.

The devices meet the design requirements of the high-performance market and power-sensitive applications such as notebooks, telecommunications equipment and handheld instrumentation. The devices are currently supported by Synario Design Automation and Philips' XPLA Designer. [841](4180)

**ENTER 3647 ON CARD**

**High-visibility plasma panel display module with dc converter**

Vishay Components has available the APD-320G064 plasma panel display module from Dale Electronics. It comes complete with drive electronics, TTL level data interface and integrated dc converter. This full dot-matrix display is made up of 320 columns and 64 rows and measures 519mm x 106mm. A built-in dc-dc converter generates the necessary panel voltage.

The module features TTL

level video interface and a slim profile. A high contrast viewing angle of 150degrees minimum and long distance readability make the module suitable for applications in arcade games, process control, POS terminals, medical equipment, message centres and ATMs.

It features a wide range of text and graphics capabilities and characters are large and bright. [1590](19065)

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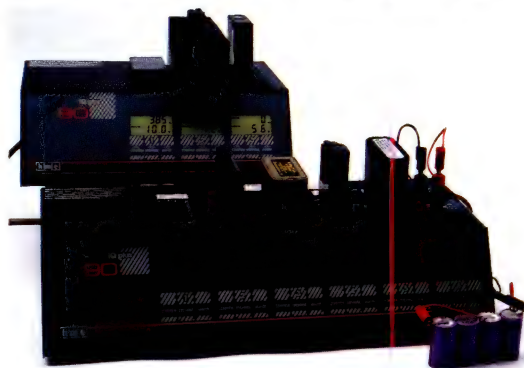
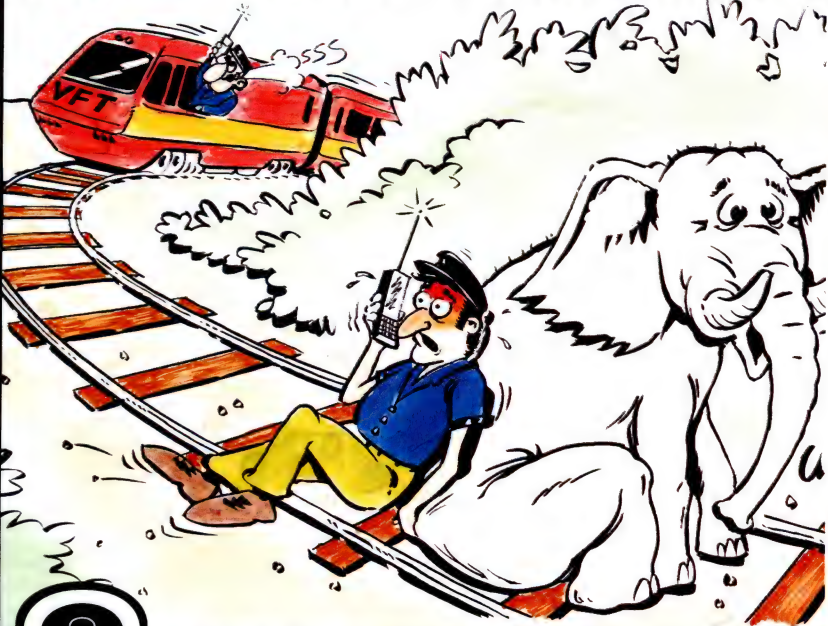
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| 73         | Advanced Systems                 | 8651             |
| 47         | Alpha Kilo Services              | 8634             |
| 16, 17     | Advanced Micro Devices           | 8609             |
| 81         | Alfa-Tek                         | 8659             |
| 11, 77     | Arlec                            | 8604, 8654       |
| 35         | Austest                          | 8621             |
| 47         | Australian Amp                   | 8632             |
| 24         | Australian Photonics             | 8614             |
| 28         | Automation & Process Control     | 8618             |
| 23         | Braemac                          | 8613             |
| 57         | Comtest                          | 8641             |
| 83         | Crusader Electronics             | 8660             |
| 78         | Data Electronics                 | 8655             |
| 41         | Densitron                        | 8625, 8626, 8627 |
| 2          | EDA Solutions                    | 8600             |
| 65         | Elektron                         | 8644             |
| 12         | EMC Technologies                 | 8605             |
| 47         | Entech                           | 8633             |
| 43         | ES Rubin                         | 8628             |
| 44         | GEC                              | 8631             |
| 1          | Global Lightning Technologies    | 8603             |
| 27         | Hartec                           | 8617             |
| 73         | Hawker Richardson                | 8650             |
| 15         | Hewlett Packard                  | 8608             |
| 79         | Hy-Q International               | 8658             |
| 59         | IRH Components                   | 8642             |
| 79         | James Coppel Lee                 | 8656             |
| 57         | KD Fisher                        | 8640             |
| 14         | Kenelec                          | 8607             |
| 48         | Mayer Krieg                      | 8635             |
| 79         | M+H Power Systems                | 8657             |
| 37         | MPM Components                   | 8623             |
| 19, 49, 71 | National Instruments             | 8610, 8639, 8649 |
| 21         | Obiat                            | 8612             |
| 53         | Philips T&M                      | 8637             |
| 87, 88     | Philips Components               | 8662             |
| 71         | Power Supplies Australia         | 8648             |
| 61         | Powertel                         | 8643             |
| 71         | Premier Batteries                | 8647             |
| 20         | Priority Electronics             | 8611             |
| 52         | Radiometer Pacific               | 8636             |
| 73         | R&D Electronics                  | 8652             |
| 43         | RFI Industries                   | 8630             |
| 32, 33     | Siemens                          | 8619             |
| 85         | Scientific Devices               | 8661             |
| 24         | Style Print                      | 8615             |
| 55         | Tektronix                        | 8638             |
| 69         | Tenrod                           | 8646             |
| 29, 34     | Tercel                           | 8622, 8620       |
| 75         | Thomas                           | 8653             |
| 43         | TRI-Components                   | 8629             |
| 4, 25      | Veltek                           | 8601, 8616       |
| 13         | VME Systems                      | 8606             |
| 37         | Westinghouse Industrial Products | 8624             |



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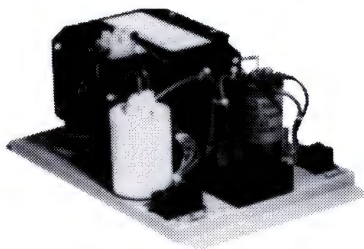
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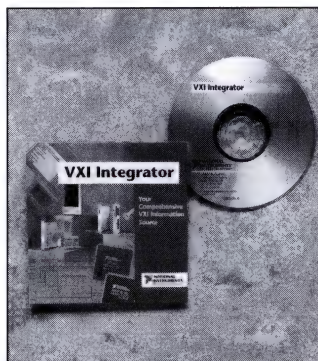
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ENTER 8649 ON CARD



### 14 channel thermocouple input module



Scientific Devices has available Iotech's DBK52 14-channel thermocouple input module, the company's latest addition to its DBK series of compact, economical signal conditioning and expansion products for PC-based data acquisition systems. The device features 14 convenient popular SMP-style thermocouple connectors, enabling users to easily plug in and configure up to 14 thermocouple inputs. It supports an array of thermocouple types — J, K, S, T, E, B, R and N. The module ensures precise measurements over a wide range of

operating temperatures by automatically measuring and correcting system offset via cold junction and auto-zero compensation.

The notebook PC-sized unit is compatible with Iotech's DAQ PCMCIA A/D cards, DaqBook parallel port based portable data acquisition systems and DaqBoard AT bus plug-in boards. Users can install 16 DBK52 modules in any one system for a total of 224 inputs. Extensive software is available to configure, record and analyse the measurement data in a number of formats. [388](103)

**ENTER 3649 ON CARD**

### Direct-to-digital temperature sensor

Veltek has announced the first direct-to-digital temperature sensor that can be multiplexed. Multiple DS1820 1-Wire Digital Thermometers from Dallas Semiconductor can be placed on a single twisted pair wire, eliminating the complexity and dramatically reducing the expense of distributed temperature measurement. The device provides 9-bit temperature readings, and only one wire (plus ground) needs to be connected from a central microprocessor to a DS1820 to send information back and forth. A worker can stand at the host station and read temperature remotely. This solution eliminates the need for a lot of analogue circuitry and reduces the need for shielded cable.

The device measures temperatures from -55°C to +125°C

in 0.5°C increments, and converts temperature to a digital word in 200ms (typical). In order to ensure that temperatures stay within the required range, the DS1820 features a user-definable, nonvolatile temperature alarm setting. An alarm search command identifies and addresses devices whose temperature is outside of programmed limits so the user can take action to adjust the temperature.

The thermometer is available in a 3-lead device that save pin count or as a 16-pin SSOP for surface mount applications. It is suitable for use in HVAC environment controls, sensing temperature inside buildings, equipment or machinery, and process monitoring and control. [2480](3946)

**ENTER 3650 ON CARD**

### Chipset for digital set-top box

ICD has announced SGS-Thomson's chipset that can integrate the digital and data conversion functions of a set-top box into just five devices. The partitioning of the chipset has been optimised to provide maximum cost savings without compromising the box manufacturer's ability to build differentiated products, while the hardware and software tools ensure fast time to market.

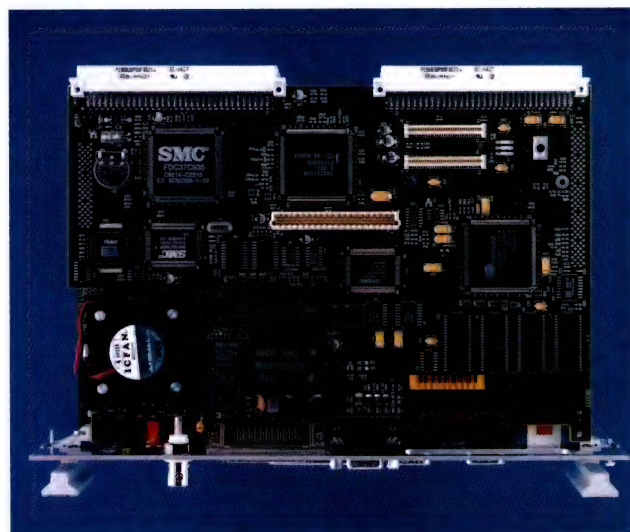
The five devices are the STV0190 analogue-to-digital converter, the STV0196 link IC, the ST20TP1/2 programmable transport IC, the STi3520A integrated audio/video MPEG2 decoder, and the STV0116/7 PAL/NTSC

digital video decoder. Both the MPEG2 decoder IC and the programmable transport IC (which includes a 32-bit processor) aid box manufacturers with product differentiation through graphics enhancements and functionality.

The company claims the STV0196 link IC is the first multi-standard solution to reach the market. This digital satellite receiver front end is specially designed for the fast-growing direct broadcast satellite (DBS) digital TV receiver market. It is packaged in a compact 14 x 14mm PQFP package and consumes little power (600mW typical). [841](13234)

**ENTER 3651 ON CARD**

### 200MHz Pentium VMEbus CPU



VME Systems has announced the availability of VMIC's VMIVME-7587 Pentium on VMEbus board. This Intel Pentium processor is compatible with the entire installed base of applications for Windows NT, 95, Windows, DOS, OS/2 and UNIX software for the PC/AT architecture.

Features include 100-200MHz versions of CPU; enhanced VMEbus/PCibus interface using the high-performance Universe chip; up to 64Mb EDO DRAM using 72-pin SIMMs; external L2 cache — 512Kb synchronous burst SRAM; on-board IDE

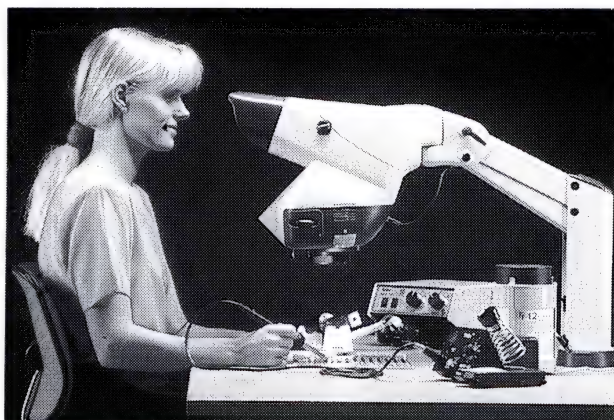
hard drive and floppy drive controllers; two high performance 16550-compatible serial ports; enhanced parallel port with ECP/EPP modes supported; PS/2-style keyboard and mouse ports on front panel; PCI mezzanine expansion site: IEEE-P1386 common mezzanine and standard; and a VMEbus interrupt handler, interrupter and system controller.

A full line of VMIC support software is also available, including VMEaccess for DOS and I/O Works Access for Windows and Windows NT. [394](954)

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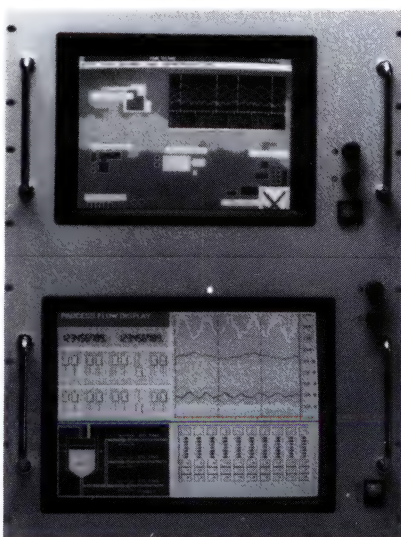
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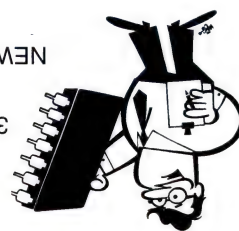
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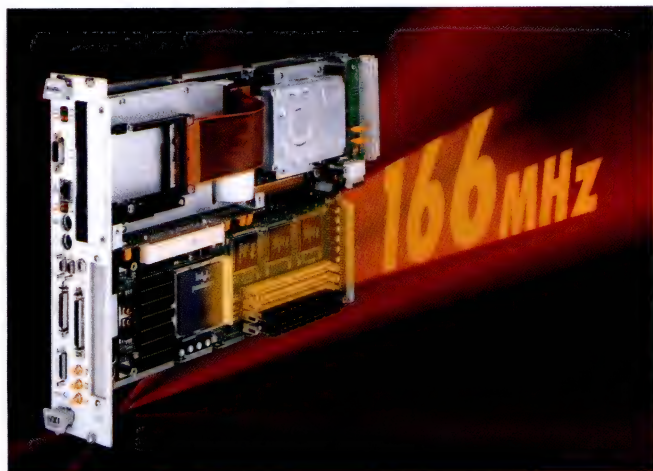
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ENTER 8652 ON CARD



**Fast embedded PC VXI controller**

National Instruments has announced a 166MHz version of its VXIpc 850 embedded VXI controllers. The new device exceeds the performance of the company's previously announced 133MHz version. All VXIpc-850 series controllers are fully VXIplug&play-compliant and are compatible with PC software tools, the company's LabVIEW and LabWindows/CVI application software, and NI-VXI/VISA bus interface software.

The two-slot series can be ordered with between 16 and 80MB of field-upgradeable DRAM and all models come with an 800MB internal enhanced IDE hard disk. Larger hard drives may be ordered based on market

availability. The front panel of the devices features connectors for a Super VGA monitor, a GPIB interface, serial and parallel ports, SCSI-2 and 10BaseT Ethernet. Also on the front panel are 2 PCMCIA slots, a single full-size expansion slot that accepts either a PCI or an ISA plug-in board, VXI clock and trigger signals, and an internal floppy drive.

Users who previously purchased the 133 or 100MHz VXIpc-850 embedded controllers can inexpensively upgrade their instrumentation systems simply by replacing a modular daughterboard containing the new processor. [841](9180)

**ENTER 3653 ON CARD**

**Low on-resistance 800V MOSFETs**

GEC Electronics has available five high-voltage parts from IXYS Corp, an expansion of their line of power MOSFETs. All five devices offer a minimum blocking voltage of 800V and are fabricated using the company's HiPerFET process, which guarantees a high avalanche energy rating and a faster switching intrinsic rectifier, providing higher reliability while reducing component cost in power switching circuits.

The new HiPerFETs range in current from 8 to 27A and offer some of the industry's lowest on-resistance ( $R_{ds(on)}$ ) and highest current ratings

in their respective packages. For example, the 15amp-rated IXFH15N80 offers the industry's lowest  $R_{ds(on)}$  in a TO-247 package at 0.6Ohms, 20% lower than the closest competitive device. This on-resistance improvement translates to increased circuit efficiency, resulting in cooler and more reliable operation in power conversion circuits.

Applications for these devices include switched-mode power supplies, medical electro-surgical equipment, induction heating, UPS and laser power supplies. [842](13121)

**ENTER 3654 ON CARD**

**Subminiature surface-mount axial LEDs**

Elektron has available from Ledtronics a series of clear or diffused, coloured, subminiature surface-mount axial LEDs designed for limited space applications. The SML080 series of solid state LEDs is configured with the leads formed in either gull-wing, yoke and/or Z-bend configurations for PC board mounting.

The SML080CX5B (clear) and SML080TX5B (diffused) come in a wide spectrum of colours including red, yellow, green and blue. The diffused LEDs provide a wide viewing angle of 90 degrees with a high turn on/off contrast ratio, while the clear LEDs provide a high

luminous intensity ranging from 9mcd to 75mcd at a forward current of 10ma. Other colours are also possible, such as ultra red, super bright yellow, super bright blue and super bright orange.

The SML080 series is auto-insertable from tape and reel and can be mounted with the use of reflow soldering. The devices are packaged in 1,500 piece per industry standard 7in reel. They are also available in bulk. In addition to being shock and vibration resistant, the LEDs weather unusually high temperatures extremely well. [1590](19988)

**ENTER 3655 ON CARD**

**Surface-mount aluminium electrolytic capacitors**

Philips Components has announced three surface-mount aluminium elcap series that allow the use of high-capacitance values in surface-mount technology. The CLB 136 series, characterised by very low ESR and high ripple-current capability per unit volume, is principally for filtering in SMPS circuits, especially in applications requiring high levels of miniaturisation. The series is available in capacitances from 10 to 470µF.

The CLB 165 series, with a maximum operating temperature of 125°C, is particularly suitable for operation in high-temperature surroundings, for example in the engine compartment of motor vehicles, as well as

for a whole range of filtering, smoothing, and buffering applications in professional and industrial areas. This series is currently available in capacitances from 10 to 330µF, with plans to extend to 470µF.

The CLB 048 series offers an extended capacitance range from 10 to 680µF with voltage ratings from 10 to 100V. This makes the range suitable for energy storage applications and telecom applications where rated voltages greater than 65V are required.

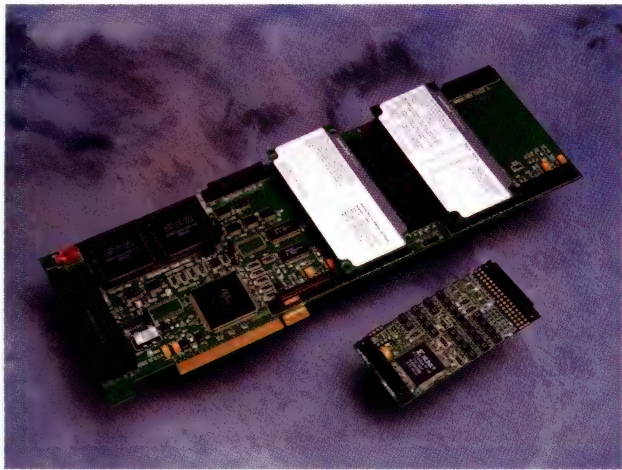
The three series come in nominal case size of 10 x 10 x 14mm and are supplied in blister-tape on reel suitable for automatic placement. [792](4180)

**ENTER 3656 ON CARD**



## NEW PRODUCTS

### Carrier boards for PCs



VME Systems has available Greenspring Computers' ATC40 IndustryPack carrier board for PCs. The device converts a 386, 486 or Pentium computer with a 16-bit ISAbus into a powerful industrial controller. By incorporating three industry-standard IndustryPack I/O modules per slot, a low-cost industry-standard platform may be customised to perform data acquisition, data communication, digital I/O, motion control, process control, instrumentation, material handling, or other I/O intensive applications. Up to 1600 I/O points may be directly added into an eight slot motherboard

or backplane.

Because the devices are modular, only the capabilities required need be purchased. The wide range available means most applications can be supplied off-the-shelf. Up to four single-wide or two double-wide modules plug onto the ATC40 carrier, taking up a single 16-bit ISA slot. An unlimited number of ATC40 carriers may be installed in a backplane or motherboard.

The ATC40 provides full support for IndustryPack capabilities, including I/O space, ID space, memory and interrupt vectors. [387](954)

**ENTER 3657 ON CARD**

### Sensor/actuator chip for PC closed-loop control

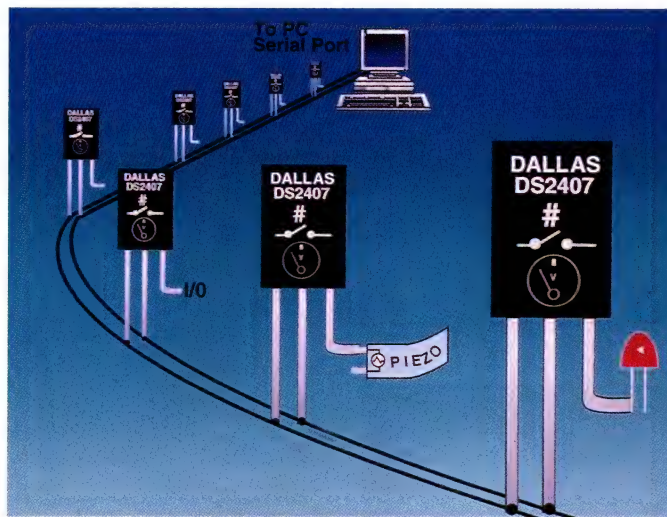
Veltek has announced a sensor/actuator chip that can perform closed loop control from a central PC. The DS2407 addressable switch, an RS232 instrument, can activate a switch and can also monitor the presence or absence of voltage. The two voltage sensors and two output transistors inside the DS2407 can be dynamically configured for operation as one sensor and one switch; two sensors; or two switches.

From the serial port of the PC, a twisted pair telephone wire can be routed up to 300m to multiple addressable switch-

es. One signal plus ground provides the digital communication link as well as the power of the sensors/actuators. Each device is individually addressable — dozens of chips can be put on the same twisted pair wire and have a central PC turn them on or off individually. Because the device draws its power from the communication line, no external power supply is required.

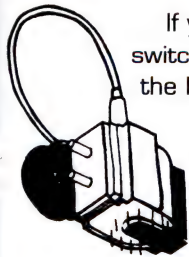
Applications include home, laboratory or factory automation, burglar alarms, irrigation control, greenhouses and vending machines. [841](3946)

**ENTER 3658 ON CARD**



## Looking for computer monitor repair parts?

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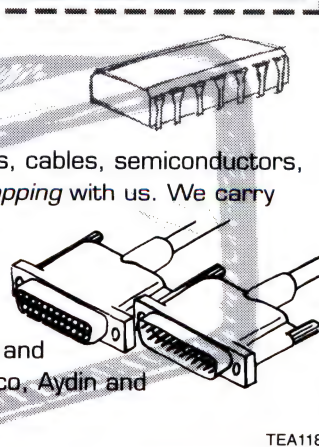
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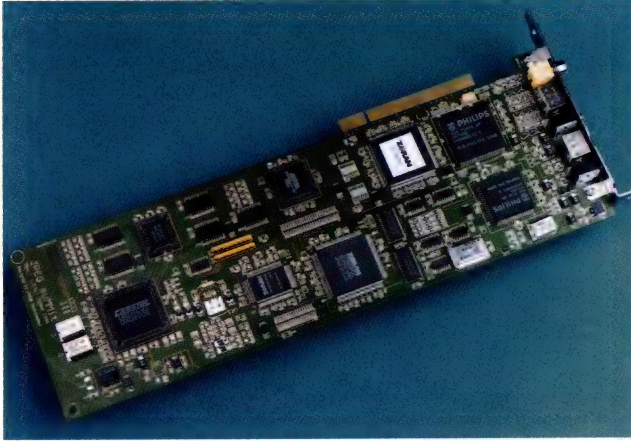
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### PCI controller for studio-quality video



R&D Electronics has introduced Zoran's PCI controller chip, the ZR36057 that enables OEMs to build studio-quality video recording, playback and editing boards at consumer-level prices. While traditional high-end boards require large external buffers and glue logic, the Zoran chip's PCI-based solution integrates most of these functions on-chip and takes advantage of the PCIbus to enable manufac-

turers to sell studio-quality video editing boards for desktop computers for a fraction of the price. The chip works in conjunction with the company's ZR36050 and ZR36016 JPEG chipset to provide manufacturers with a complete video editing solution. The company has also developed a reference design board, the JPEG suMMit which enables quick utilisation of these chips. [841](70)

**ENTER 3659 ON CARD**

### DPAK case surface-mount rectifiers



Logic 4 has available Central Semiconductor's latest line of rectifiers in a surface-mount DPAK case.

The range includes Schottky rectifiers and ultra-fast recovery rectifiers in 3 and 6amp versions, which are direct replacements for Motorola's MBRD and MURD series. [799](11037)

**ENTER 3660 ON CARD**

### Tantalum chip filter capacitor

Vishay Components is offering a conformal coated tantalum chip capacitor designed for superior performance in Pentium and other low-frequency filter applications. The Sprague 594D provides a combination of low equivalent series resistance, good power dissipation, and miniaturisation not available with other technologies. It offers up to 35% greater volumetric efficiency when compared to moulded tantalum chips of the same rating.

It is available in C, D and R case codes, and has a capacitance range of 4.7 $\mu$ F - 470 $\mu$ F, covering ratings from 4 to 50V. Within these parameters its low ESR (0.450 $\Omega$  to 0.055 $\Omega$ ) provides superior ability to control ripple current and ripple voltages in filter circuitry. The chips are 100% surge-conditioned and are designed for high speed surface mounting from bulk or tape and reel packaging. [792](19065)

**ENTER 3661 ON CARD**

### Miniature EL displays

Amtex Electronics announces the introduction of Planar small EL displays which are a cost-competitive high-performance alternative to small LCDs, LEDs and VFDs. These small graphics displays (SGDs) range from 64 x 40 pixels to 480 x 240 pixels and provide the same image quality and environmental ruggedness as Planar's other EL displays.

The displays are suitable for use in a wide variety of applications, including home healthcare devices, global positioning systems, intelligent man-machine interfaces, point-of-sale displays and vehicular information systems. The displays provide at-a-glance read-

ability, which is essential for avoiding errors in reading vital information and minimising operator eye fatigue.

Planar's integral contrast enhancement technology used in the SGDs features a light-absorbing display background, combined with bright and ergonomically-optimal amber-coloured EL pixels. This enables high image contrast and crispness in every detail displayed on the screen. Image quality is claimed to be perfect over the entire 160° viewing cone, and no additional contrast enhancement filter is necessary. [1590](2807)

**ENTER 3662 ON CARD**

### Single-board computer evaluation platform



Alfa-Tek has available the Spectrum Digital EVM320C5X, a low-cost, single board computer evaluation platform featuring the Texas Instruments TMS320C50/51 digital signal processor. The module was specifically designed to allow engineering and software personnel to rapidly develop, debug and benchmark software algorithms and quickly prototype custom application hardware.

The platform is an off-the-shelf stand-alone controller for low or medium volume applications and provides the programmer with the facility to familiarise themselves with digital signal processing principles.

In addition to this module, Spectrum Digital also offers a series of companion

modules which aid in the development of hardware and software projects. The include the analogue interface module featuring Texas Instruments' TLC3204X analogue interface circuit and a prototyping module for developing custom circuitry.

The single-board computer interfaces to any IBM-compatible PC by simply attaching the supplied cable to the RS232 port and typing a single command to load the menu-driven display. The EVM320C5X is fully compatible with the EMU320C5X scan path emulator, the EDS320C5X expandable development system and the SFI320C5X scan function interface. [690](696)

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## LCD panel PC



Intelligent Systems has announced the release of the IAC-W1200, a panel PC with a 10.4in TFT or STN liquid crystal display. These units include a 4-slot ISA-bus passive backplane and provide space for two 3.5in drives and one 5.25in disk drive. They are constructed with a heavy-duty steel chassis and a sealed aluminium alloy front panel which meets tough industrial and envi-

ronmental protection standards.

The units can be configured with various half-size CPU cards and support the popular low-cost PS/2-type power supply. This special design meets

the needs of customers where an economic and easily maintained unit is their main concern. With an operating temperature of  $-10^{\circ}\text{C}$  to  $55^{\circ}\text{C}$ , these units meet all the requirements for an industrial man-machine interface.

A touchscreen is available and a standard DIN keyboard connector is situated on the side of the unit. [387](19267)

**ENTER 3664 ON CARD**

## High-clarity colour monitor

Advanced Systems has available a monitor from KME for applications in process control systems, financial dealing rooms and medical electronics where ruggedness, reliability and clarity are paramount. Cased and chassis-mounted versions are available.

The square-case version is easily stackable and buttable to facilitate the creation of a wall of as many monitors as are necessary, suitable for displaying the constantly-changing data typical of dealing-room applications. For such high monitor density applications, adjacent-monitor interference is eliminated by the use of Mumetal shielding.

Display clarity is enhanced by the use of a dark glass, non-glare, high resolution CRT

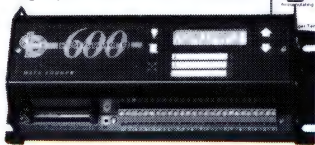
presenting up to  $1280 \times 1040$  pixels and horizontal scan rates up to 64kHz. The 17in monitor uses digital display control to control all the parameters of the display. The use of a high-quality plated through-hole circuit board assures reliability in conditions of severe vibration. A mean time between failures in excess of 30,000 hours puts the series in a class of its own.

The chassis-mounted version is suitable for systems integrators. The 19in rack-mounted version is designed for panel installation and the cased version can be free mounted side by side or stacked. Models are also available in desktop, tilt/swivel styles and in a wide range of custom colours. [389](47)

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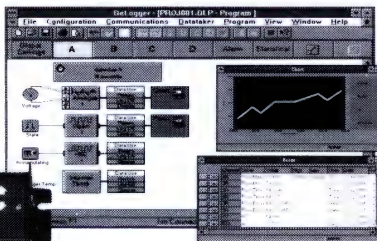


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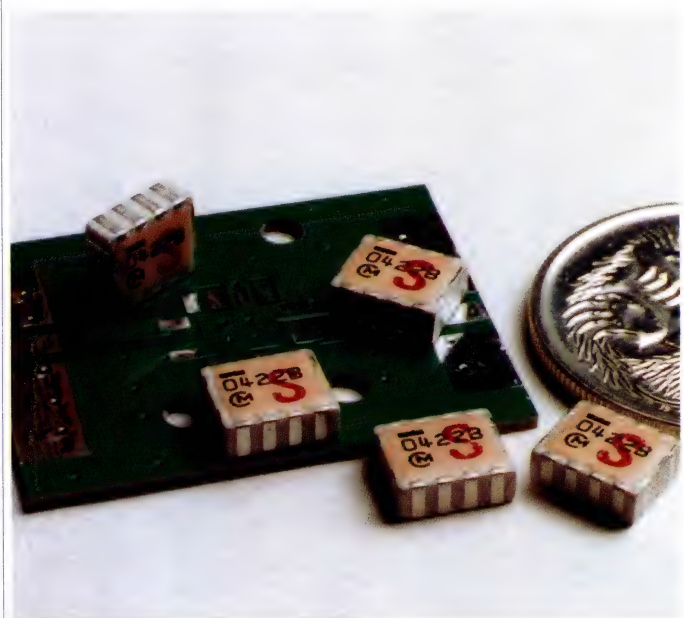
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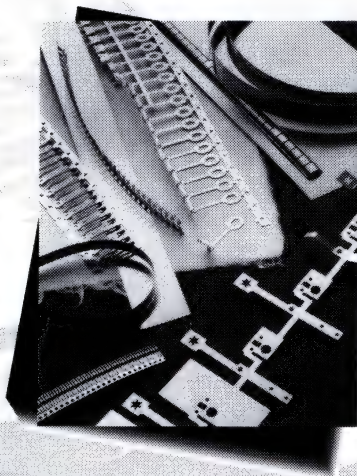
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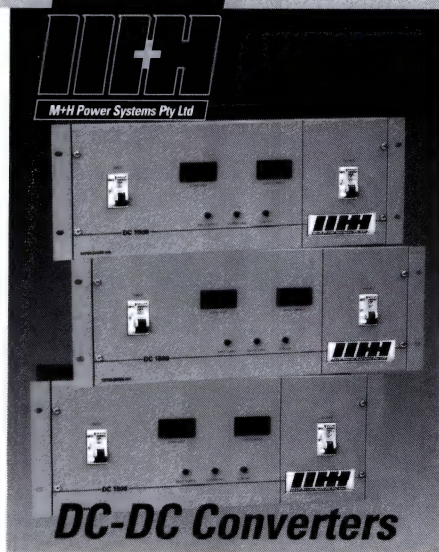
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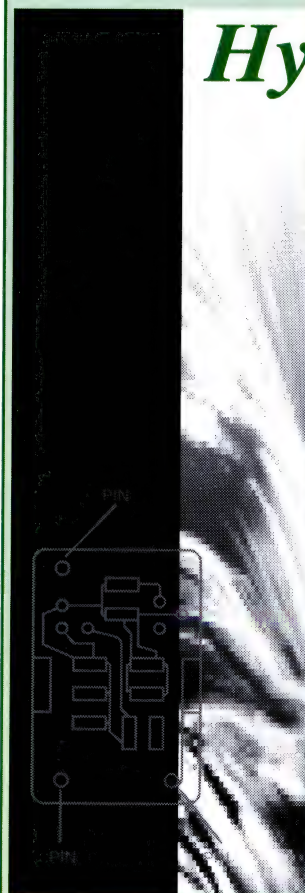
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# Recovering from multiple power fluctuations

Power supply fluctuations can cause microprocessor systems to behave erratically. Alfredo Chingcuanco explains how to make your design cope gracefully with multiple power dips.

**E**mbedded systems often use power failure detection circuits such as the one shown in *Figure 1(a)*. In this circuit, a common power-management IC, the 691 (Maxim, Linear Technology, and Analog Devices), monitors a simple voltage divider. The IC generates a non-maskable interrupt (NMI) to the system microprocessor when the raw dc input falls below a certain level (1.3V for the 691). You scale the resistors R1 and R2 such that the power management IC generates an NMI before the regulated dc input droops low enough to shut down the system microprocessor.

This simple setup can fail, however, when multiple power fluctuations follow each other rapidly — a common occurrence in the real world. Many microprocessors overwrite vital state registers as a part of their non-maskable-interrupt responses. If a second NMI occurs before the microprocessor finishes its power-failure-interrupt routine, the microprocessor cannot restore its original, pre-power-failure, state. Also, depending on the number of fluctuations of the raw dc input (and hence, the number of stacked NMIs), the microprocessor's stack could possibly overflow, corrupting your program's code or data.

Following the manufacturers' recommendations to add an optional hysteresis resistor, R3, around the 691 will not solve the multiple-fluctuation problem if input-power excursions exceed the hysteresis band.

The hysteresis voltage is given by the equation:

$$V_{\text{HYSTERESIS}} = V_H - V_L$$

$$V_H = 1.3 * [1 + R1/R2 + R1/R3]$$

## Listing 1

```
main(){
...
}
...
char dummy[24]                ; temporary stack for interrupt routine
...
#define PFO_BIT 6              ; test bit for checking /PFO's state
#define JUMP_VEC_NMI_VEC myint ; declare interrupt vector
#define asm
myint::                        ; label for interrupt routine
    ld    sp,dummy+24          ; force stack pointer to top of array dummy
                                ; to prevent overrunning stack
```

*Do whatever service possible here, within allowable execution time. Then:*

```
loop:
    call    hitwd              ; "hit" watchdog to prevent its timing out
                                ; during brownout
    ld      bc,PFO             ; set up for reading /PFO's state
    in      a,(c)              ; read /PFO state
    bit     PFO_BIT, a         ; check state of /PFO
    jr      z,loop             ; wait until the brownout condition clears
                                ; then...a tight loop to force a watchdog timeout
timeout:
    jp      timeout            ; This loop will eventually reset the Z180
#define asm
```

*If your watchdog is not enabled or your system lacks one, you can force the microprocessor to restart execution at 0x0000. Substitute this program fragment for the "timeout" fragment above.*

```
restart:
    ld      a,0xe2              ; set up Z180 MMU
    out0    (CBAR),a           ;
    jp      0000h              ; jump to 0x0000
```

*Of course, if the raw dc input voltage drops and stays low, then the system will just power down. The routine ensures that the watchdog does not time out and thereby reset the processor prematurely. Some microprocessors can continue to run, after a fashion, at low voltage. Operating erratically, they might not be able to detect the /PFO's state correctly or they might overwrite vital state data.*



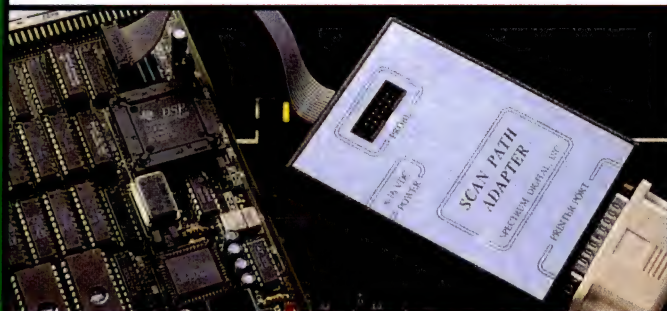
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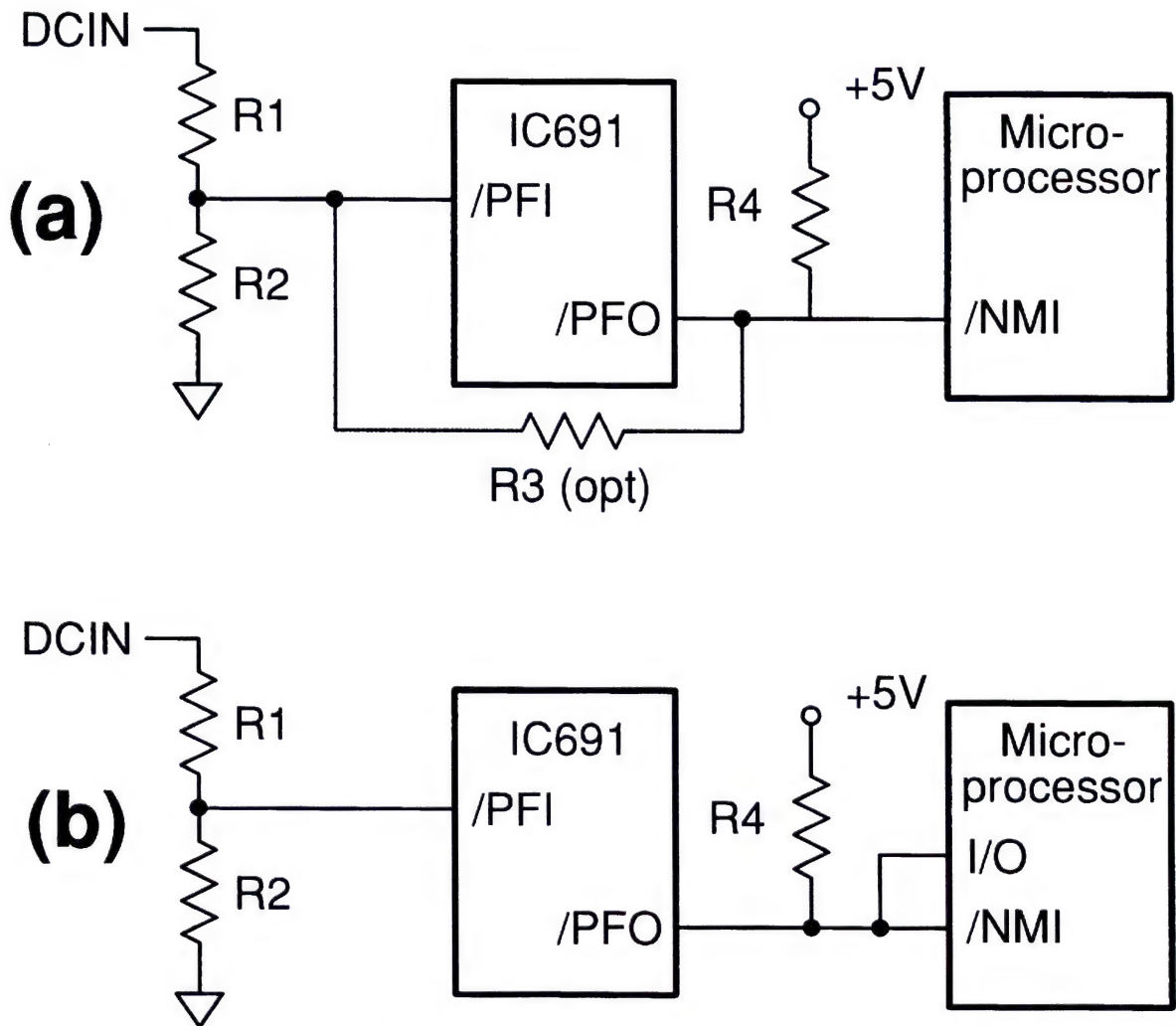


Figure 1. Allowing the system microprocessor to sample the state of the power-fail signal, /PFO, protects the system from errors arising from multiple NMIs during brownouts.

$$V_L = 1.3 * [1 + R1/R2 - (5V - 1.3V)R1/1.3V(R3 + R4)]$$

For  $R1 = 51k\Omega$ ,  $R2 = 10k\Omega$ ,  $R3 = 300k\Omega$ , and  $R4 = 10k\Omega$ ,  $V_{HYSTERESIS}$  is approximately 830mV.

Having the system microprocessor read the state of the power-management IC's /PFO line is the key to handling multiple power fluctuations. Figure 1(b) shows the /PFO connected to an I/O line of the system microprocessor as well as its /NMI input. The microprocessor can thus determine if the raw DC input is still in a low-voltage (or "brownout") state, or has returned to the normal operating level.

The program in Listing 1 is for the Zilog Z180, an enhanced Z80; but the strategy can be easily adapted to other processors. In response to a power-fail-

ure /NMI, the Z180 saves its program counter (PC) on its processor stack. It copies its maskable interrupt flag, IEF1, to another internal register, IEF2, and zeroes IEF1. The Z180 later restores saved state information when it executes a RETN (Return from Non-Maskable Interrupt) instruction. To prevent corrupting the system stack, the routine reserves some memory for its own stack.

The program in Listing 1 assumes that system's watchdog timer (if any) has been enabled. When the 691 detects a brownout and asserts /PFO, the system microprocessor begins executing the interrupt-service routine in Listing 1. The routine first takes care of saving the system's vital state data.

While responding to a power-failure interrupt, the interrupt-service routine can save a only a finite amount of state

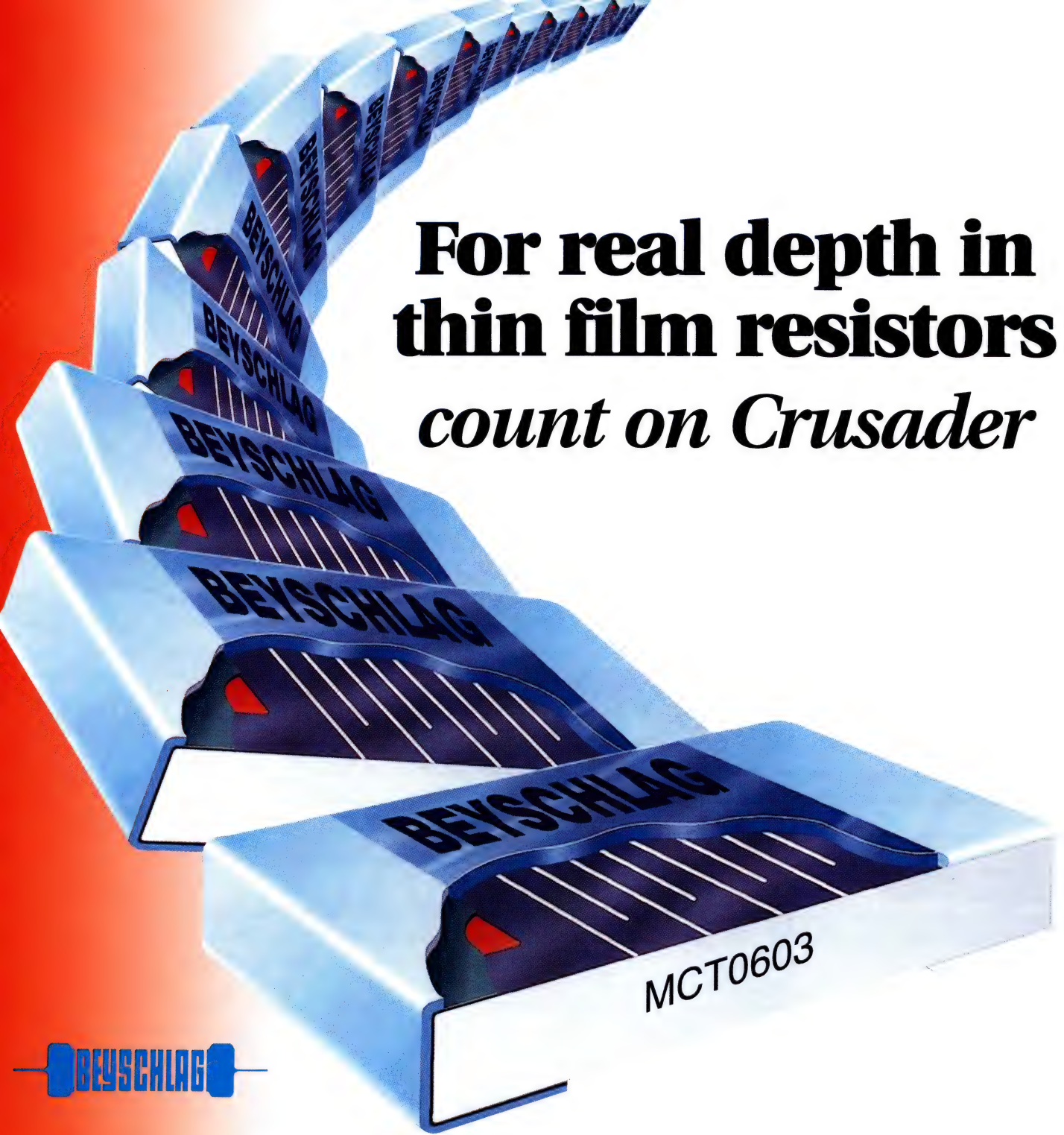
information. The amount of code the microprocessor can execute to save the data depends on the rate of decrease of regulated dc voltage after the raw dc voltage drops below the power-failure threshold.

The routine then enters a loop, checking the status of the /PFO line and resetting the watchdog timer. When the power returns, the program exits either allowing the watchdog timer to reset the system or jumping to a RESET routine, as applicable. The routine never returns from the first /NMI and thus never has to worry about multiple NMIs. □

Alfredo Chingcuanco is a design engineer for Z-World Engineering, Davis, CA, represented in Australia by Dominion Electronics.



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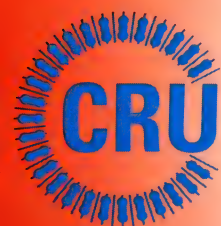
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# Ian Neville

## *Right side of the tracks*

Ian Neville is the managing director of Cardcorp, Australia's only company manufacturing smart cards locally. He anticipates a huge increase in demand for smart cards in the region and his company is poised ready to ride the smart card wave when it rolls in.

Ian Neville was born in Crown Street Women's Hospital in Sydney in 1952 and grew up in the Sydney suburb of Wahroonga. He attended Normanhurst Boys High ... but only briefly. He had a rebellious streak and, as Ian puts it "I went out through the bathroom window at age 14 and disappeared for a couple of years."

He dropped out of school and ran away from home, but surfaced eventually to take up a boilermaking course at Meadowbank Technical College as part of an apprenticeship with a company called Olding Equipment. Welding wasn't to Ian's tastes, and after finishing his apprenticeship, he got a job in fleet selling with Ford.

In 1973 he made a spur-of-the-moment decision to take off on a trip around Europe with his then girlfriend. "I went for six weeks and stayed away for nine years!" recounts Ian.

The pair arrived in the UK with no money, so Ian got a job selling cars, but found it hard to make any real money. He did some research and found that everyone was talking about computers as the field to be in. In 1975 he started casting the net in the computer industry. "I went for a few jobs in the computer industry, but because I wasn't speaking their language, I couldn't communicate to the people I was trying to sell myself to."

To bridge the communications barrier, Ian enrolled in a COBOL programming course at London University after "fudging" his academic qualifications.

About six months into the course he



started to apply for jobs again. Ian eventually settled into a job with Dymo Business Systems, which manufactured plastic cards at the time. He trained as a salesman in the north of England and within 12 months was the company's national sales manager.

After about three years with Dymo an opportunity presented itself to return to Australia. "They [Dymo Business Systems] had a distributor here in Australia called Jenkins Security that wasn't performing very well. I heard about it and thought it was time to go home. After 12 months of negotiations, I came back to Australia to expand the company [Jenkins], which was a little privately-owned card manufacturing operation in Melbourne."

The move was fortuitous and brought him back to Australia just as plastic cards were starting to become big business here. "At that time magnetic stripe cards had only just started. It was in the early days of Medicare, Bankcard was out, but not really established, and Visa and Mastercard hadn't really taken a foot hold. I came at the right time because, armed with the knowledge I had from the UK, which in those days was a little bit ahead of Australia, I was able to get involved in some big projects like Commonwealth Bank Mastercard."

With Jenkins, Ian opened offices in Sydney, Brisbane, Perth, Adelaide and Canberra. "Our only competitor was a company called Thorn EMI, which in those days was the biggest card manufacturer in the world." Ian's expansion of the Jenkins business didn't sit

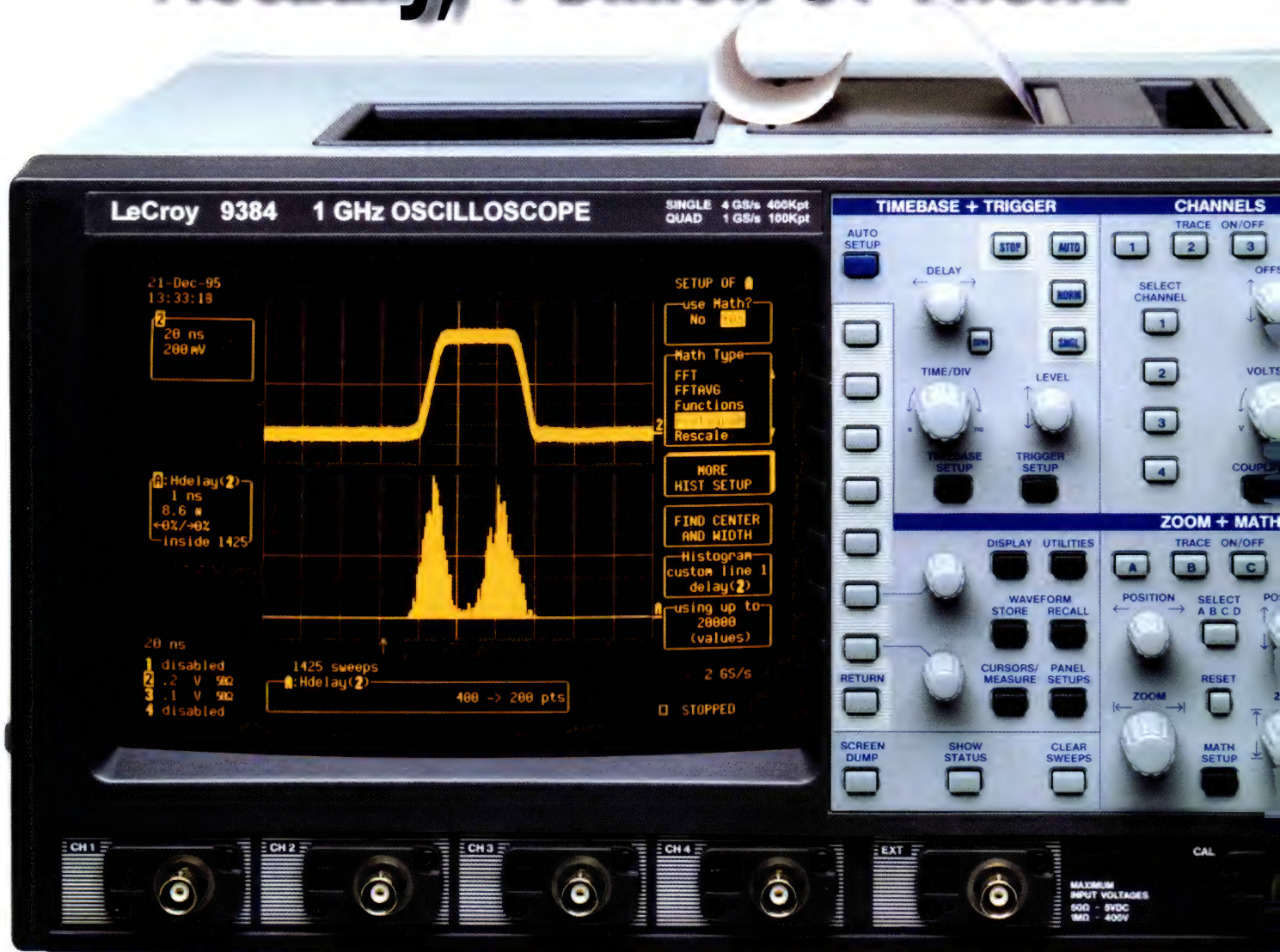
well with Thorn EMI, who bought out the family-owned business in 1983. Ian stayed with the new owners. "There was some internal realignment within Thorn EMI, and I was given the task of general manager of Thorn EMI Card Services."

It wasn't long before Thorn EMI in turn sold the card business to UK company National Business Systems (NBS). A period of change followed the sale, which Ian wasn't very happy with. Also, he wanted to expand the business into the 'small end' of the market such as clubs, an idea in which neither Thorn nor NBS were interested.

In mid-1987 Ian felt it was time to bite the bullet and put his theories to the test. He left NBS and bought what was left of the Australian operation of ISCS,



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a Danish company that had unsuccessfully tried to break into the Australian card market. "I did some digging and found the company [ISCS] had an office in Bathurst Street [in Sydney] and telephone number in the phonebook under 'plastic cards'. So I made them an offer for basically a couple of desks, a couple of filing cabinets, an entry in the phonebook."

When Ian bought the company it had two contracts and was having its cards manufactured in Thailand. In 1989 Ian made the investment in building a local manufacturing plant in Sydney. He continued to expand the company's manufacturing capabilities and eventually relocated to a larger factory in Rydalmere.

Up until then the company had mainly been involved in magnetic stripe cards. In 1994 Ian had a representative of a company called Keycorp drop in to talk to him about smart cards. "My interpretation of smart cards in those days, and it may still be true today, was that it was a solution waiting for a big enough problem."

It wasn't the first time Ian had been exposed to smart card technology. "Going back quite a way, I was fortunate in the UK to be invited to the public launch of smart cards, 15 or 16 years ago. I thought it was interesting, but didn't know what you would do with it or how you used it."

"If you go back that amount of time, there weren't any PCs. The PC actually came a little afterwards. There were also questions about durability. I remember I was handed a card and thought it looked pretty impressive. I bent the card and the chip actually flew out of the card. A Frenchman sitting next to me said 'you bloody English, you will destroy anything.' I said that if it can't survive that, then it can't survive the market."

Keycorp, which was in the business of developing transaction terminals and systems, wanted to set up a smart card manufacturing plant, and wanted Ian's expertise. "What Keycorp had identified was that if you're making a terminal that's going to accept a smart card, somebody's got to supply the smart card." Ian felt the idea had merit and approached his shareholders, who weren't interested in taking the risk of investing in a new plant at that time. Ian then arranged for Keycorp to buy out the share holding of ISCS. He and Keycorp then formed a new company, Cardcorp, on November 7, 1994.

"Really from that day on, time has passed like a bolt of lightning." The company moved to new premises, which Ian had designed from the ground up to accommodate an expanding smart card capability, as well as the now substantial magnetic stripe card production. In March 1995 a smart card production line arrived,

and in April the company started producing smart cards — the first and still the only company to do so in Australia. "Since that time we've been accredited by Visa, Mastercard, Bankcard, and the Association of GSM Providers, to name a few. The factory is regarded as one of the best in the world as far as its production facility and security goes."

Being the only company to manufacture smart cards in Australia is a fact of which Ian is justifiably proud. "I think at the last trade show I went to I saw 10 or 12 companies implying they made smart cards here. There is no one besides ourselves making smart cards in Australia. The others are importing them from all over the world. And that does no good for the Australian economy. We built this facility to stifle the imports. It's something that we can do in this country that doesn't need to be imported."

***"Regardless of what some people say, the smart card hasn't come of age just yet."***

"We are 100% Australian owned, and that's the way it will stay. We've had offers from other companies to do joint ventures, but we believe, rightly or wrongly, that Australia's got to do it on its own."

With Keycorp designing and developing terminals and software, its manufacturing partner AEMS making the terminals, and Cardcorp manufacturing the cards, Australia's involvement in the smart card future is looking strong. "It really is what I refer to as a smart triangle of business. All divisions are profitable and all divisions stand on their own feet, though division is not a word I like — we're all freestanding companies as well."

"Australia and Cardcorp are in a good position at the moment, but we can't afford to be complacent. We have two main competitors with massive international clout and they could move very quickly to install a smart card line. But buying the equipment is one thing, getting it to run and doing the research on the plastics and adhesives you need takes some time. We were fortunate that we got in at a time when we didn't have the pressure to deliver."

The pressure to deliver is one thing Ian would welcome now, however, and he has built his factory to cope with an anticipated flood of demand once the major credit providers decide on the smart card route. "Regardless of what some people say, the smart card hasn't come of age just yet. It will when Visa and Mastercard start using it — then all hell will break loose. Once Visa and Mastercard go the smart card route, that will be the main thoroughfare if you like." Ian is expecting an announcement from the credit companies on the use of smart cards by the end of the year.

While Ian is geared up to handle the card production demand, he does worry about the availability of the silicon which, come the smart card revolution, could dry up very quickly if Ian's estimates for demand are accurate. "What I'd like to see is a local company pick up on making the silicon. There's good dollars in that. There's got to be somebody around who can do what the French and Germans are doing. It's expensive to bring the modules in from overseas and the potential market is huge."

"There's not just going to be millions of smart cards, but billions of them. In Australia, a country of 17 million people, the market is producing about 70 million cards of all types. If you just take Visa, Mastercard and Bankcard, which are the ones that will definitely migrate to smart cards, I estimate they'll need six to seven million chips per year. Our next neighbour up the road, Indonesia, is a country of 200 million people and there's a card explosion happening there. But they're not going to go to magnetic stripe, they'll go straight to smart card. Look at Malaysia, Singapore, Thailand and Vietnam — they're all coming of age and they're looking at smart cards."

"I foresee that when Visa and Mastercard say go, and with the other projects I know are happening around the world, there's going to be a shortage of silicon to put on cards. There's an opportunity for somebody there."

When Ian's not making cards you can often find him on the road bashing cars! "I'm an active supporter of Variety Club and as such I get involved in its bashes. We've got a lot of kids out there that need assistance. We have a lot of problems with young people unable to get jobs and taking drugs — and I can understand their frustration. But I look at myself when I was at school. I hated school and I ran away from home. Through good fortune rather than good management I fell on the right side of the tracks. I'm very mindful of that."

Ian has two teenage boys of his own and lives with his wife Janis in the Sydney suburb of Pennant Hills. □





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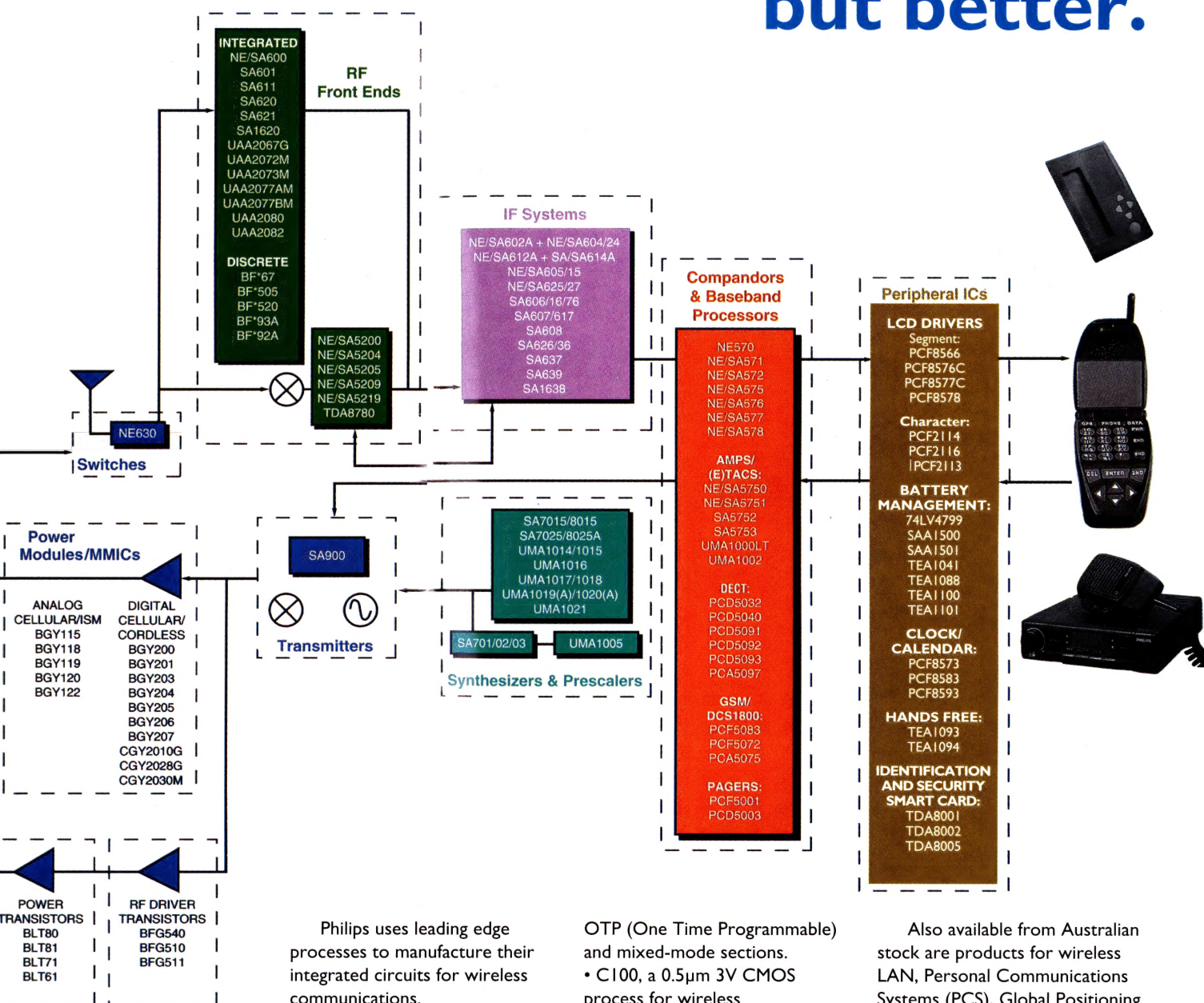
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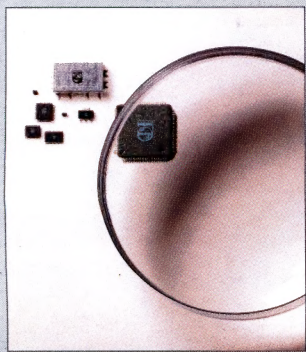
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